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# GADGET PLAYING AND TV WATCHING HABITS IN CHILDREN AGED 2–5: ANTECEDENTS AND EFFECTS/ OUTCOMES

Education Policy and Research Association

MICS



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# A. EXECUTIVE SUMMARY

## RESEARCH TOPIC

The 2018 Georgia Multiple Indicator Cluster Survey (MICS) evaluated electronic device usage by children under five years of age. Mothers or caretakers were asked the following question: During the past seven days did the child watch and/or play with electronic devices, such as computer, mobile, tablet or TV? This inquiry forms the basis of this report. In the report, we discuss the developmental characteristics of children aged 2–5 years and the effects of using electronic devices. We focus on the contextual and/or individual factors that may encourage or hinder the frequent use of electronic devices by children. Accordingly the main part of the report, which includes the analysis of the research data, will be divided into two parts: 1. Prerequisites or antecedents for the use of electronic devices by children (what circumstances contribute to the frequent use of electronic devices by children?) and 2. Effects/Outcomes (what impact does the use of electronic devices have on a child's major areas of development at the target age?)

In this report, we have tried to answer the following main research questions:

1. *What factors lead to the frequent use of technology by children aged 2–5 years?*
2. *Is there any relationship between children's use of electronics and their early childhood development index? If yes, how does the frequent use of electronic devices affect the early childhood development and its dimensions?*

## MAJOR FINDINGS

### Potential predictors

- The general tendency is for children to use electronic devices for less than one hour a day. Observed result is acceptable for the target age group (two to five years old), according to the recommendations of paediatric associations. [1] The most powerful predictor that affects the usage of electronic devices by children is the age of the child. The older the child, the more often he/she uses gadgets. This result is especially noteworthy for policy makers and other stakeholders because they know who is the most vulnerable target audience and therefore, who should be given special attention in the future.
- Children living in urban areas use technology more often than children living in rural areas.
- Children from Tbilisi use electronic devices more often than children from other regions. The highest rate of usage of technology by children for more than one hour a day after Tbilisi (41 per cent) was reported in Adjara (38 per cent), Imereti and Kvemo Kartli (35 per cent in each).
- The higher the family wealth index, the greater the chance that children will use electronic devices for more than one hour a day. For households in the first category, the percentage of children who use technologies for more than one hour is the smallest. In the third and fifth categories of wealth index, 32 per cent of children used technologies for more than an hour a day and it's the highest rate reported.

1 See details in the recommendations section.

- Household density is the stronger factor associated with the use of technologies by children, than the number of household members. In crowded households, the number of children who use electronic devices for more than one hour a day reduces. However, the association between the household density and the usage of electronic devices by children can be a function of children's age. The older a child gets, the less the household density affects the frequency of the usage of electronic devices by children, as it was the case with the number of household members. This is possibly because the degree of independence in a child increases with age.

- The presence of other children under the age of five in a household is associated with a low frequency of usage of electronic devices by children. In households with only one child, the likelihood that that child will use electronic devices for more than an hour a day increases compared to the households with more than one child.

- For those children who have access to electronic devices and internet, the probability of using them for more than an hour a day almost doubles. The result is maintained even after taking into account the contextual, household and child factors.

- The children, whose mothers have higher education, were 1.518 times more likely to use electronic devices or watch TV for more than one hour a day compared to the children whose mothers do not have a higher education. The same picture remains when we assess the impact of a father's education.

- From the data on adult's involvement in the MICS, the only statistically significant predictor of the usage of electronics by children is mother's involvement. The more engaged the mother is, the likelihood that the child will use electronics for more than an hour a day decreases.

- The more children's books and picture books a child has, the more often he/she uses electronic devices. Association remains statistically significant even if we control for the standard variables related to the context, household and child characteristics.

- Presence of toys increases the frequency of use of electronic devices by children. These results can be explained by the fact that in households where caregivers can buy children's books, picture books and toys, the frequency of use of electronic devices is more a result of access to financial resources in the household.

- Children who experienced any psychological or physical aggression used electronic devices more often than those who did not. In both cases, the difference remains statistically significant, albeit slightly decreasing, even after controlling for other characteristics (urban living, internally displaced person status, wealth score and child's age).

## Potential outcomes

In this section we discuss Early Childhood Development (ECD) and its four dimensions: Literacy and numeracy, socio-emotional development, physical development and learning skills.

- The ECD index of children aged 2–5 years who are using electronic devices longer than one hour a day is 0.5 times less likely to reach a satisfactory threshold.

- A similar result is found in terms of socio-emotional development. The socio-emotional development of children using electronics for more than an hour a day is 0.4 times less likely to reach a satisfactory threshold.

- As part of our research, we explore the tendency according to which the use of electronic devices has a negative impact on the index of early childhood development and, in particular on its socio-emotional dimension. Statistically significant associations between the usage of electronic devices by children and other dimensions of their early childhood development was not revealed. However, an in-depth study of the issue is needed in the future.

# B. INTRODUCTION

In recent decades, in the wake of technological advances and the information revolution, television, internet, and digital devices have become an integral part of the daily lives for almost all of us. Generations grow up in constant, direct or indirect, contact with electronic devices and television (Erstadt, 2012) (Furlong & Davies, 2012) (Livingstone, Haddon, Görzig, & Ólafsson, 2011). Consequently, the study on the impact of electronic devices is of particular interest to researchers and policy makers (Hasebrink, Livingstone, & Haddon, 2008). The research findings on the effects of electronic devices on the development of children and adolescents has not unequivocally revealed the nature of these influences—whether it is always negative or positive. When discussing the nature of the impact, it is important to consider the context. In this case, it's who the target audience is. It is extremely important to evaluate the effects of electronic devices in terms of key milestones of child development for the target age group. One of the reasons why understanding the impact of screen time is important is because it can be habit-forming: The longer the children spend time with the screen, the harder it will be to turn screens off when they get older (Christakis & Zimmerman, 2006). Preschool children spend more time on screens and less time in the real world, and so, have less time for creative play, social face-to-face interactions, physical activities and communication with parents and caregivers. These activities contribute to a child's development. For example, research findings suggest that children's language development may be negatively affected by electronic toys as it reduces communication with the parent (Wooldridge & Shapka, 2012). Research findings also suggest that screen time can affect sleep by stimulating irregular bedtime. Screen time is exciting, especially at bedtime, and exposure to light can alter the secretion of melatonin (Thompson & Christakis, 2005) (Higuchi, Motohashi, Liu, Ahara, & Kaneko, 2003).

This report, based on the data collected by Georgia MICS 2018, is dedicated to the study of possible factors and potential outcomes influencing the frequency of use of electronic devices by children aged 2–5 years.

**** For the purpose of this study, the words "technology", "electronics", "media" are defined as devices with screens, such as smartphones, iPads, Kindles, tablets, computers and laptops. The definition of technology, electronics and media also includes television because in the research process these devices were combined into one question and it is not possible to differentiate and analyse the time spent by the child with each electronic device individually.***

# C. ABOUT GEORGIA MICS 2018

The 2018 Georgia Multiple Indicator Cluster Survey (MICS) was carried out in 2018–2019 by National Statistics Office of Georgia in collaboration with United Nations Children's Fund (UNICEF) and National Center for Disease Control and Public Health (NCDC), as part of the Global MICS Programme. Technical support was provided by UNICEF, with funding and financial support from UNICEF, NCDC, United States Agency for International Development (USAID), World Bank, United Nations Population Fund (UNFPA), Swedish International Development Cooperation Agency (SIDA), French Development Agency (Agence Francaise Developpment, AFD), Swiss Agency for development and cooperation (SDC), Italian National Institute of Health (Istituto Superiore di Sanità, ISS), United Nations Development Programme (UNDP) and World Health Organization (WHO).

The Global MICS Programme was developed by UNICEF in the 1990s as an international multi-purpose household survey programme to support countries in collecting internationally comparable data on a wide range of indicators on the situation of children and women. MICS measures key indicators that allow countries to generate data for use in policies, programmes and national development plans, and to monitor progress towards the Sustainable Development Goals (SDGs) and other internationally agreed commitments. Since 2005, MICS in Georgia has not been conducted and only a limited number of MICS indicators were collected through other surveys. The objective of the 2018 Georgia MICS was to generate data for the critical assessment of the progress made in various areas and to identify areas that require more attention. The MICS collected disaggregated data for the identification of disparities, allowed evidence-based policymaking aimed at social inclusion of the most vulnerable and validated data from other sources and the results of focused interventions. Moreover, reacting to reports of lead poisoning of children in Georgia, the 2018 Georgia MICS also provides nationally representative indicators of lead prevalence in children aged 2–7 years.

For more information on the Global MICS Programme, please go to *mics.unicef.org*

# MICS OBJECTIVES

The primary objectives of Georgia MICS 2018 are as follows:

- to provide high quality data for assessing the situation of children, adolescents, women and households in the 2018 Georgia MICS;
- to furnish data needed for monitoring progress toward national goals, as a basis for future action;
- to collect disaggregated data for the identification of disparities, to inform policies aimed at social inclusion of the most vulnerable;
- to validate data from other sources and the results of focused interventions;
- to generate data on national and global SDG indicators;
- to generate internationally comparable data for the assessment of the progress made in various areas, and to put additional efforts in those areas that require attention; and

to generate behavioural and attitudinal data not available in other data sources. [2]

# SAMPLING STRATEGY

The sample for the 2018 Georgia MICS was designed to provide estimates for a large number of indicators on the situation of children and women at the national level, for urban and rural areas, for ten regions: Tbilisi, Adjara A.R, Guria, Imereti, Racha-Lechkhumi and Kvemo Svaneti1, Kakheti, Mtkheta-Mtianeti, Samegrelo-Zemo Svaneti, Samtskhe-Javakheti, Kvemo Kartli, Shida Kartli as well as for internally displaced persons. The urban and rural areas within each region were identified as the main sampling strata, each main stratum (Region by Urban/Rural) was further divided into internally displaced persons and non-internally displaced persons strata. The sample of households was selected in two stages. Within each stratum, a specified number of census enumeration areas were selected systematically with probability proportional to size. After a household listing was carried out within the selected enumeration areas, a systematic sample of 20 households were drawn in each sample enumeration area. The total sample size was 14,120 households in 706 sample clusters. As the sample is not self-weighting sample weights are used for reporting survey results. A more detailed description of the sample design can be found in Appendix A (Sample Design) of the Georgia MICS Report (2019). [3]

# QUESTIONNAIRES AND DATABASES

Seven questionnaires were used in the survey: 1) a household questionnaire to collect basic demographic information on all de jure household members (usual residents), the household and the dwelling; 2) a water quality testing questionnaire administered in five households in each cluster of the sample; 3) a questionnaire for individual women aged 15–49 years administered in each household ; 4) a questionnaire for individual men aged 15–49 years administered in every second household; 5) an under-5 questionnaire administered to mothers (or caretakers) of all children under five years of age living in the household; 6) a questionnaire for children aged 5–17 years, administered to the mother (or caretaker) of one randomly selected child aged 5–17 years living in the household, and 7) a lead testing questionnaire, administered to mothers (or caretakers) of one randomly selected child aged 2–7 years living in the household. The main questionnaire of interest for us is the questionnaire for mothers (or caretakers) of children under five years of age living in the household. In the process of data analysis, depending on the purpose of the analysis, we added variables of interest from other questionnaires mentioned above. Let us consider only the parts of the mentioned questionnaires that are relevant to our research topic. Questionnaire for children under five years of age included the following relevant modules: child's background, early childhood development, child discipline, child functioning and anthropometry. The table below lists the relevant variables used in our analysis from the databases created as a result of administering the above-mentioned questionnaires.

**Table 1. Variables from the databases other than the children under five database**

2 National Statistics Office of Georgia, 2019.
3 Ibid.

| DATABASES | VARIABLES ADDED TO THE CHILDREN UNDER 5'S DATABASE |
|---|---|
| **Households Database (hh)** | Household has electricity<br>Household has television<br>Any member has a computer<br>Any member has a mobile telephone<br>Any member has a smartphone<br>Internet access is available at home<br>Number of HH members<br>Number of children under five years of age<br>Number of children aged 5–17<br>Number of children aged 2–7<br>Number of rooms used for sleeping<br>Density (number of members in the hh/number of rooms used for sleeping) |
| **Household Members Database (hl)** | Father's education |
| **Database of Women in Reproductive Age (wm)** | Mother's age |

The questionnaires used in Georgia were based on the MICS6 standard questionnaires. From the MICS6 model English version, the questionnaires were adapted and translated into Georgian, Azerbaijani and Armenian and were pretested in four regions of Georgia (Tbilisi, Mtskheta-Mtianeti, Samtskhe-Javakheti and Kvemo-Kartli). The samples for the pretest covered three different types of settlements (big city, town and village). The sample size was approximately 240 households from 29 clusters. Every third household from each of the sample clusters was interviewed during June 2018. Based on the results of the pretest, modifications were made to the wording and translation of the questionnaires.

Of the 14,120 households selected for the sample, 13,030 were found occupied. Of these, 12,270 were successfully interviewed for a household response rate of 94.2 per cent. In the interviewed households, 8,511 women (aged 15–49 years) were identified. Of these, 6,812 were successfully interviewed, yielding a response rate of 80.0 per cent within the interviewed households.

There were 2,824 children under age five listed in the household questionnaires. Questionnaires were completed for 2,540 of these children, which corresponds to a response rate of 89.9 per cent within interviewed households.

# ETHICAL PROTOCOL

(National Statistics Office of Georgia, 2019)

The survey protocol was approved by the NCDC and Public Health of Georgia in August 2018. The protocol included a Protection Protocol which outlines the potential risks during the life cycle of the survey and management strategies to mitigate these. Verbal consent was obtained for each respondent participating and, for children aged 15–17 years individually interviewed, adult consent was obtained in advance of the child's assent, and written consent to take a blood sample was obtained from the mother or caretaker of the child aged 2–7 years (selected for lead testing). The mother or caretaker was informed of the terms of conditions of participation in the lead test: purpose of the research, testing process, benefit to participants in the research, expected risk and sharing of the result. All respondents were informed of the voluntary nature of participation and the confidentiality and anonymity of information. Additionally, respondents were informed of their right to refuse answering all or particular questions, as well as to stop the interview at any time.

# D. THEORETICAL FRAMEWORK

Factors potentially related to the frequency of use of electronic devices by children, including potential predictors and outcomes, are divided into several categories. In particular, we have highlighted the following:

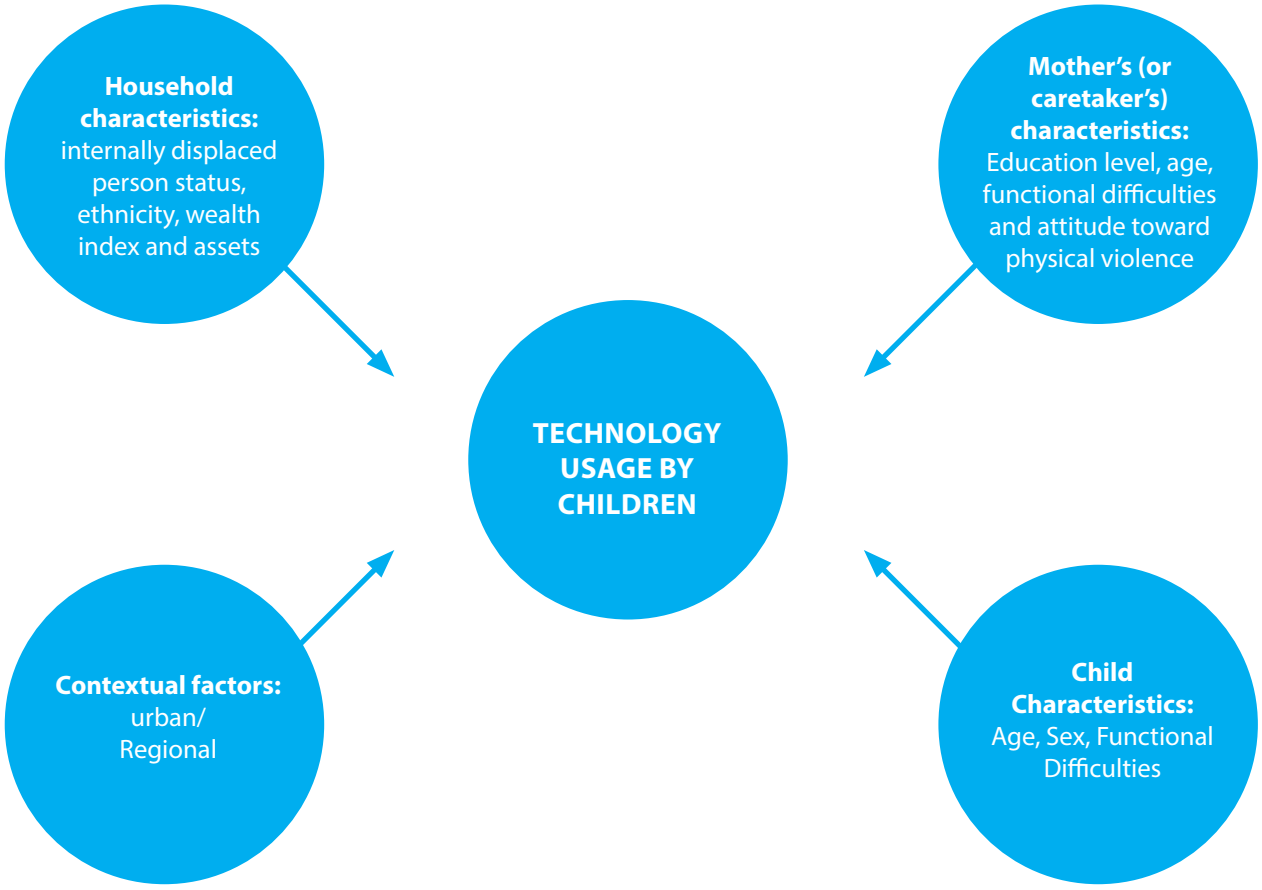
- **Contextual factors,** such as the location of a child's residence (urban/rural) and the region here the child lives;
- **Household factors,** such as ethnicity of the head of the household, internationally displaced person status, household wealth index, household asset (whether the family has a TV, computer, smartphone, internet access), grandparents living with the child and presence of other children;
- **Characteristics of the caregiver,** such as maternal age, level of education, functional disability status and attitudes related to physical violence; and
- **Characteristic of the child,** such as the child's gender, age, functional disability status and early development index (literacy and numeracy, physical development, socio-emotional development and learning ability).

We can order the main variables of interest according to whether they are used as a predictor in relation to the usage of electronic devices by children or as a potential outcome. Predictors and outcomes will be discussed in detail in the relevant section of this report.

Figure 1 below shows the basic conception underlying data analysis, which shares the key assumptions of Bronfenbrenner's bio-ecological theory. According to the named conception, a person develops in the context of complex bilateral relations with the various systems around him, including family, school and society (Kohlberg & Mayer, 1972). Since in our case, the target audience is children aged 2–5 years, the school has been replaced by a kindergarten,[4] and among the influential factors, the characteristics of the caregiver and the household have shifted to the forefront. The development of the child and behaviours are significantly influenced by the environment in which the child grows. The environment in this case includes both urban and regional, as well as dependent on family and caregiver's characteristics. Environmental influences are especially evident at our target age, as the child is usually characterized by a lesser degree of individuality during this period and is largely dependent on the individuals who care for him or her and with whom he or she lives. Consequently, in addition to the characteristics of the child, the child's behaviours are also a function of environmental factors and the people around the child (see Figure 1).

As the child develops in the environment of the people with whom he or she grows up, we controlled the characteristics of the environment (household factors and caregiver's characteristics) when analysing the data.

**Figure 1. The basic conception uderlying data analysis.**




4 In this report, kindergarten and early childhood education and care are interchangeable concepts.

# E. LITERATURE REVIEW AND RELATED RESEARCH FINDINGS

The use of electronic devices by children is becoming an increasingly relevant research topic in the wake of the rapid technological progress. More research is being conducted on the impact of electronic devices on children's development. According to a review of 173 studies on media exposure, children have been called Generation M due to the frequency of their media consumption (Silva, 2015). Scientists study which areas of development technology affects, what type of effect it has (whether negative or positive), what factors contribute to the frequency of technology use, and what effective interventions and strategies for using electronic devices will enhance the positive effects of this activity and minimize the likelihood of negative impacts.

There are various opinions in the scientific literature about the nature of children's use of electronic devices. Studies show that the normal use of technology has a positive effect on specific areas of a child's development. Below we will discuss the latest research findings on this issue. Because the target age group of our study includes children from ages two to five years, for the most part, the literature review and recommendation's sections will focus on information relevant to children in this age group. Nevertheless, it is clear that there are many findings in the scientific-research discourse regarding children aged 5–18 years. Since the mentioned age category goes beyond the focus of our analysis, we concentrate less on it. (For further information see e.g. (AAP COUNCIL ON COMMUNICATIONS AND MEDIA, 2016), (Chassiakos, et al., 2016)).

## MEDIA USAGE EFFECTS

When talking about media use by children at an early age, one of the most pressing questions is from what age can we talk about the benefits of using technology by children. Evidence continues to show limited educational benefits of media for children younger than two years. The recommendation from American Academy of Paediatrics to discourage media exposure for children younger than two years were based on research on TV and videos, which showed that in-person interactions with parents are much more effective than video for learning of new verbal or nonverbal problem-solving skills. This research showed that infants and toddlers experience so called "video deficit".[5] The video deficit takes place because infants and young toddlers lack symbolic thinking, immature attentional controls, and the memory flexibility required to effectively transfer knowledge from a two-dimensional platform to a three-dimensional world. Before two years of age, children are actively developing cognitive, language, sensorimotor and socio-emotional skills, which require intense hands-on exploration and social interaction with trusted caregivers for successful maturation. Therefore, relationships with adults are the most effective source of child development at this age. (Brown, A; Council on Communications and Media, 2011) (Barr, 2013). Moreover, experimental studies prove that the use of interactive media at this age has a low ecologic validity over time and children forget the information they learned independently through videos (Mendelsohn, Carolyn A. Brockmeyer, Fierman, Berkule-Silberman, & Tomopoulos, 2010).

Population-based studies continue to show associations between excessive TV viewing in early childhood and cognitive, language and socio-emotional delays. Possible mechanisms for these outcomes include the effects of viewing inappropriate adult-oriented content, inappropriate child-directed content, a decrease in parent–child interaction when the TV is on, and poorer family functioning in households with high media use.

5 Video deficit is difficulty learning from two-dimensional video representations at younger than 30 months of age.

An earlier age of media use onset, greater cumulative hours of media use and consumption of content that is not of high quality all are significant independent predictors of poor executive functioning (impulse control, self-regulation and mental flexibility) as well as "theory of mind" deficits (i.e., empathy—the ability to understand others' thoughts and feelings) in pre-schoolers. Media multitasking, once thought to be a pastime of only adolescents, now is observed even in children younger than four years. The orienting response to novel stimuli is very strong in young children, so their attention is drawn to the engaging and quickly changing features of digital media, such as animation, sounds, and highlighted features they can tap and swipe. These features, however, may decrease young children's comprehension. It is unknown whether rapid shifts in attention to and from digital stimuli may have long-term effects on children's attention span or information processing. (Chassiakos, et al., 2016) (AAP COUNCIL ON COMMUNICATIONS AND MEDIA., 2016)

Research findings suggest strong associations between violent media content and aggressive behaviour in children. Hence why parents should continue to monitor the content of their children's media. Today, more children own and use mobile devices independently, making monitoring and regulation much more difficult. Parents should be especially careful in selecting methods for managing and regulating the frequency and content of technology use by their children.

Research shows that screen time above the two-hours threshold at five years of age was associated with an increased risk of clinically relevant externalizing morbidity and specifically inattention problems. The association between screen time and behavioural morbidity was greater than any other risk factor including sleep, parenting stress and socioeconomic factors. The findings indicate that preschool may be a critical period for supporting parents and families on education about limiting screen time and supporting physical activity. (Tamana, et al., 2019)

One of the related contents discussed in relation with the screen media[6] exposure of children is obesity. Obesity is one of the most challenging public health problems facing both developed and developing countries worldwide. Screen media exposure is one of the best-documented causes of obesity in children and, likewise, obesity is one of the best-documented outcomes of screen media exposure. A number of possible mechanisms are thought to explain the effects of screen media exposure on obesity. These include displacing physical activity, increasing energy intake from eating while viewing and/or the effects of advertising, and reducing sleep. (Robinson, et al., 2017) Media usage is also linked to cardiovascular risks. As a child grows, the nature of the potential benefits and harms of using technology changes. Content such as social media, cyber-bullying, tolerance (vulnerable to the influence of significant others), privacy risks, sexting,[7] child pornography and child abuse are becoming more relevant. (Chassiakos, et al., 2016) Therefore, special care should be taken with regard to children of this age by parents and professionals (teachers, psychologists, social workers, etc.) so that their gross interference does not backfire.

One mechanism by which heavy technology exposure negatively affects child development is by **displacing language- and play-based interactions** with adults (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009). The instant accessibility and portability of mobile devices make them potentially more likely to displace human interactions and other enriching activities. Because thousands of applications are marketed as "educational" (without evidence for this claim), parents may feel comfortable with this relative increase in screen time. Although interactive media are well suited to teach concrete knowledge (so-called skills and drills), other important pre-academic skills, such as self-regulation, empathy, social skills and problem-solving are primarily learned through children exploring the natural environment, interacting with peers and caregivers, and playing in unstructured, creative ways. Moreover, interactive media use by young children may displace sensorimotor activities (e.g., manipulation, climbing, building) that support development of visual-motor skills, which are important to later success in math and science. (Radesky, Schumacher, & Zuckerman, 2015)

6 In this report screen media refers to content on any technology platform with a screen.
7 Sexting is commonly defined as the electronic transmission of nude or semi-nude images as well as sexually explicit text messages.

Parents' use of interactive media also has the potential to distract from parent-child interactions. Parent media use usually involves work, errands, or social or other content requiring significant information processing, which makes it harder to balance attention between devices and managing child behaviour. (Radesky, et al., 2014) On the other hand, videophone applications may enhance interpersonal connections by allowing children to maintain face-to-face interactions with distant family members or during military deployment.

It should be noted that research also indicates a positive effect of the use of technologies by children. Research suggests, **that interactive media can have an educational value**—such as learn-to-read applications and electronic books may increase early literacy skills by providing practice with letters, phonics and word recognition. E-books can be useful in promoting vocabulary development and reading comprehension and could be more engaging for young children via digital scaffolds (e.g., oral narration, synchronous text highlighting, and embedded sound effects, animations, or games). (Radesky, Schumacher, & Zuckerman, 2015) This is one example of why it is important to consider the type of content a child consumes and not just manipulate the frequency of use when talking about the effects of using technology.

**Usage of technology can be a distraction from distress.** The ability of mobile media to effectively distract and entertain young children is used to help children cope during anaesthesia induction or medical/surgical procedures. The use of technology becomes entertaining and serves as an escape for children, especially in the process of daily routine, such as traveling by car, eating out and so on. Usually, in order for the child to have fun in situations that are boring for the child, parents allow the child to use electronic devices. On the one hand, it is a kind of "shut-up toy", which is quite instrumental in specific situations. On the other hand, however, the child must develop the ability to self-regulate. This way, the usage of technology every time a child gets bored could be detrimental. Self-regulation is a key social skill that helps a child adapt to various life challenges and helps the child function effectively in adulthood. This seemingly harmless gadget may even hinder the development of self-regulation skills in the long run because the child has been taught to calm himself/herself down through it (Radesky, Schumacher, & Zuckerman, 2015).

Like traditional media use, a child's use of mobile and interactive media does not occur in a vacuum. Many factors including parenting style, socioeconomic status and child temperament modify the positive and negative effects of media on children's behaviour and development. Most important is parent-child or teacher-child (Roseberry, Hirsh-Pasek, & Golinkoff, 2013) interaction during media use: how we use technology rather than the technology's qualities per se. Mobile and interactive media have great potential to promote learning through joint engagement between caregivers and children by demonstrating ideas for parent-child activities or by modelling teaching strategies (e.g., dialogic reading, phonetic or sound blending skills) with which low-literacy parents may not be familiar. (Radesky, Schumacher, & Zuckerman, 2015)

In the latest research literature on this issue, researchers differentiate between passive and active use of electronic devices by adolescents. Research findings suggest that passive screen time was associated with mood and anxiety disorders, whereas active screen time was not. Passive screen time was defined as the time spent with electronic devices during which a person watched TV, movies, and videos including YouTube. While active screen time was considered the time spent with electronics during which a person was working, playing games, emailing, chatting, surfing the Internet, etc. Adolescents reporting four or more hours of passive screen time per day, compared to those reporting less than two hours, were three times more likely to meet the DSM-IV-TR criteria for major depressive episode, social phobia and generalized anxiety disorder (Kim, et al., 2020).

While this age category is not our target population within a particular study, passive screen time itself is exactly what is relevant in the case of children of our target age. If it has such a negative effect on adolescents, we should not be surprised by the large concentration of attention paid to the use of electronic devices by younger children. Curiosity, interest in the outside world is leading at this age, because everything is still new for a child. Children do not need external motivation and encouragement to ask the question "why" and it is the most powerful source of development. Passive screen time is involved in this process as ready-made content, where images change so fast in front of the child, he/she cannot comprehend the content. This deprives the child of the desire to ask the "why" question. The above can be considered as one of the mechanisms of negative impact of electronic devices on various areas of child development.

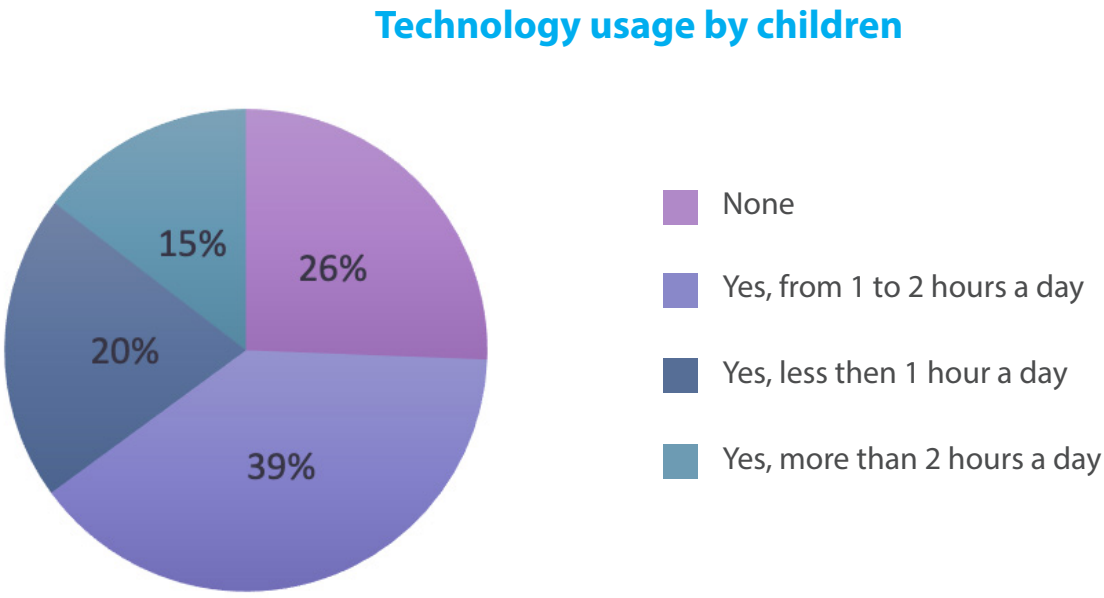
# F. USAGE OF TECHNOLOGIES BY CHILDREN AGED UNDER FIVE CONCEPT IN GEORGIA MICS 2018

## Operational definition

In this section of the report, we will discuss the operational definition of major concept of interest. We present information on how these concepts were measured and what type of data they provide.

**Usage of electronic devices and TV watching by children aged 2–5 years.** In our study, the usage of electronic devices by children was measured at the ordinary level and expressed as frequency. In particular, when asked the question: "during the past seven days did child watch, play with electronic devices, such as computer, mobile, tablet or watch TV?" Parents answered to the following scale: did not use; yes, less than one hour a day; yes, from one to two hours a day; and yes, more than two hours a day. Respondents were parents or caregivers of children aged 2–5 years. "These results are not measures of true prevalence, and should not be used as such, but rather the period-prevalence of access on electronic devices over a week time window." (National Statistics Office of Georgia, 2019)

**Figure 2. Usage of electronic devices by children—frequency[8]**




It's obvious that majority of children from two to five years use technology for less than an hour a day, or do not use technology at all (see Figure 2). Accordingly, we combined the frequency of use of electronic devices by children into two dimensions: (1) usage for a period of less than one hour a day, or no usage at all;[9] and (2) usage for more than one hour a day. We considered this modification expedient considering that there was almost no variation in the original four dimensions, which minimized the possibility of distinguishing them from each other. The analysis of the results will be presented using the mentioned two-dimensional model.

8 Total number of children in target age group was 2540.

9 We recoded the target variable and from four-dimensional model created a two-dimensional one as follows: We created a new variable of the usage of technologies by children, where those who used it less than an hour a day, or didn't use at all transferred into category 1 (less than an hour a day) and from all other (those who used technologies from one to two hours a day and more than two hours a day) we created new category 2 (more than an hour a day).

## MEASURING CHILDREN'S MEDIA USE: PREVIOUS STUDIES

The first question that arises for those interested in researching the use of technology by children is what is the most accurate, reliable and valid measurement of the use of electronic devices by children. This question revolves around two main issues: (a) What amount of media do children use? (i.e. questions that focus around the total number of uses) and (b) What types of content do children watch on electronic devices? (i.e. questions that focus on the quality and quantity of media content). It is extremely difficult to give relevant answers to these seemingly simple questions. The complexity of the issue directly affects the complexity of the research methodology. In this section we will discuss research methods related to the use of electronic devices by children.

Usually studies of media consumption by children focus on the frequency of use. There exists a variety of approaches to measuring time use. These include: (a) global time estimates, (b) time diaries, (c) media diaries, (d) experience sampling methods (ESM), (e) video or direct observation, and (f) electronic monitoring systems (specifically, Nielsen People Meters and Arbitron Portable People Meters [PPMs]). We consider each in turn. Table 2 presents a list of major studies of children's media use by research method used.

**Table 2. Major studies of children's media use by research method used**

*Source: (Vandewater & Lee, 2009)*

| Research Method | Study | Year | Age Range | Design | Media Measured | Public Use |
|---|---|---|---|---|---|---|
| Global time estimates | National Longitudinal Survey of Youth | 1997 | 12–16 years | Panel | TV | Yes |
| | Michigan Study of Adolescent and Adult Life Transitions | 1983–2000 | 5th and 6th grade | Panel | TV, computer | Yes |
| | Early Childhood Longitudinal Study | 1998–1999, 2001 | Kindergarten-12th grade, birth–1st grade | Panel | TV, computer | Yes |
| | The National Longitudinal Study of Adolescent Health | 1994–1995 (Wave 1), 1996 (Wave 2), 2001–2002 (Wave 3) | 7th-12th grade | Panel | TV, video games, computer | Yes |
| | The National Institute of Child Health and Human Development Study of Early Child Care | 1991–1994, 1995–2000, 2000–2005 | 0–3 years, 54 months-1st grade, 2nd-6th grade | Panel | TV, video games, computer | Yes |
| | National Health and Nutrition Examination Survey | 2002 (Wave 2) | 2+ years | Panel | TV, video games, computer | Yes |
| | Panel Study of Income Dynamics–Child Development Supplement | 2003–2004 | 8–18 years | Panel | Videogame, computer, Internet | Yes |

| Research Method | Study | Year | Age Range | Design | Media Measured | Public Use |
|---|---|---|---|---|---|---|
| | Kaiser Family Foundation (2005) (Generation M) | 2003–2004 | 8–18 years | Cross-sectional | TV, DVDs, videotapes, video games, movies, radio, MP3, CDs, tapes, computer, Internet | No |
| | Anderson et al. (2001); (Early Childhood Television Viewing and Adolescent Behavior) | 1994 | 15–19 years | Panel | TV | No |
| | Anderson, Field, Collins, Lorch, & Nathan (1985) | 1980–1981 | 5 years | Cross sectional | TV | No |
| **Time diary** | American Time Use Survey | 2004 | 15+ years | Cross sectional | TV, games, computer, Internet | Yes |
| | Panel Study of Income Dynamics–Child Development Supplement | 1997 (Wave 1), 2002 (Wave 2) | 0–12 years, 5–18 years | Panel | TV, video games, computer | Yes |
| **Media diary** | Anderson et al. (1985) | 1980–1981 | 5 years | Cross sectional | TV | No |
| | Huston, Wright, Rice, Kerkman, & St. Peters (1990) | 1981–1983 | 3 and 5 years | Panel | TV | No |
| | Kaiser Family Foundation (2005; Generation M) | 2003–2004 | 8–18 years | Cross sectional | TV, DVDs, videotapes, video games, movies, radio, MP3, CDs, tapes, computer, Internet | No |
| **Experience sampling method** | Sloan Study of Youth and Social Development | 1992–1997 | 6th, 8th, 10th, 12th grades | Longitudinal | TV, video games | No |
| **Observation** | Anderson et al. (1985) | 1985 | 5 years | Cross sectional | TV | No |
| **People Meter and Diaries** | Nielsen | Since 1960s | 2+ years | Cross sectional | TV | No |
| **Portable People Meter** | Arbitron | Test in 2005 | Children, 6–17 years; adults, 18+ years | Cross sectional | Capturing audio/ video signals | No |

## DEFINITIONS

**Global time estimates** are always self-reported in either written or interview form. Global estimates of media use take two general forms: (a) average amount of time spent (usually hours) using various media and (b) average number of days using media (usually within a month or a week). Global time estimates questions typically pose the following questions: "How many hours did you spend watching television yesterday?", "How many hours do you spend watching television (or playing video games or using the computer) in a typical day (or a typical week?)". or "On average, how many hours did you watch television per day in the past seven days?" Respondents are asked either to simply state the number of hours or to respond to a Likert-type scale based on hours (for example, 0 to 1 hrs, 1 to 2 hrs, 2 to 4 hrs, more than 4 hrs).

**The use of time diaries** for documenting time spent in various activities comes from a strong tradition in the field of economics. The USA federal government is tremendously interested in how Americans spend their time (particularly in paid labour) and has funded large-scale studies of time use. To assess the issue of technology use by children Time Diaries modified version can be used. The methodology for this study, typical of time diary procedures, was as follows: Participants were asked to fill out a 24-hour time diary for one randomly chosen weekday and one randomly chosen weekend day. For younger children, primary caregivers were contacted the day before they were to begin recording their child's activities and were instructed to record activities as they occurred during the course of the day (for every minute of each 24-hrs period). In the case of media activities, such as TV watching and playing video or computer games, participants asked to indicate the name of the programme, movie or game.

**Media diaries** (sometimes called "viewing logs" or "media logs") are designed to capture the media use of respondents during a particular period. Media diaries are a modified form of a time diary, focused on a particular activity, namely, media use.

**ESM (experience sampling method)** was developed by Csikszentmihalyi and his colleagues to (Csikszentmihalyi, Play and intrinsic rewards, 1975); (Csikszentmihalyi & Kubey, 1981) to "study the subjective experience of persons interacting in natural environments" (Csikszentmihalyi & Larson, 1987). ESM involves signalling research participants at random times throughout the day (usually for a week but sometimes longer) and asking them to report on the nature and quality of their experience. In most studies, respondents are given electronic paging devices (beepers) and a small booklet of self-report forms. The pagers signal the research participants at random times each day hence, ESM studies are sometimes referred to as "beeper studies." Each time they are signalled, the respondents complete a page in the self-report booklet. When they are beeped, respondents typically report on what they are doing, where they are and how they feel about what they are doing.

**Direct or video-recorded observations** have long been considered the "gold standard" for measuring media use. One technique is to enter homes and directly observe viewing behaviour. A handful of media researchers have installed video equipment in participants' homes to record viewing behaviour.

**A people meter**[10] is an audience measurement tool used to measure the viewing habits of TV and cable audiences. The people meter is a box, about the size of a paperback book. The box is hooked up to each television set and is accompanied by a remote-control unit. Each family member in a sample household is assigned a personal viewing button. It identifies each household member's age and sex. If the TV is turned on and the viewer doesn't identify themselves, the meter flashes to remind them. Additional buttons on the People Meter enable guests to participate in the sample by recording their age, sex and viewing status into the system.

**The portable people meter** (PPM) is an electronic device used by Arbitron, a media marketing research firm, used to established listening habits on behalf of radio stations across the United States.

10 Source: *https://www.definitions.net/definition/people+meter*

For those interested in the impact of media on children, measuring exposure by type and amount is only a small part of the story. There is a large body of evidence indicating that the content of what children view is at least as important as they type of media used and how much they use it. The most commonly used techniques for measuring content include (a) asking children to list three to five of their favourite shows, (b) asking for programme titles within diary data, and (c) coding program content of popular shows, time slots, or video games with children of a particular age group. Given the seeming importance of content in assessing the impact of media on children, these approaches are singularly unsatisfying. None is particularly precise. Only the combinations of relevant research approaches lead us to a reliable and valid data. (Vandewater & Lee, 2009)

## PROBABLE PREDICTORS[11]

Probable predictors that were analysed as an independent variable in relation with the usage of electronic devices or watching TV by children are: children's age, sex, attendance to early childhood education programme (kindergarten), whether the kindergarten is public or private, availability of children's books, availability of playthings, child discipline, inadequate supervision, parental involvement (whether parents spend time with their children—read books, told stories, sang songs, took children outdoors, played with children, named and counted), household asset (accessibility to TV, computer, smartphone, etc.), household wealth index, mother's education level, etc.

## POTENTIAL OUTCOMES

Potential outcomes, which were analysed as a dependent variable in relation with the usage of electronic devices or watching tv by children, are the **early childhood development index (ECDI)** and it's four dimensions namely: Literacy and numeracy, physical development, socio-emotional development and learning ability.

> "Early childhood development (ECD) is a maturational and interactive process involving an ordered progression of motor, cognitive, language, socio-emotional and regulatory skills and capacities across the first few years of life. During these early years, from the prenatal periods to infancy and early childhood, a child's newly developing brain is highly plastic and responsive to change. This is evidenced by the billions of integrated neural circuits established through the interaction of genetics, environment and experience. While the overall developmental process is similar across cultures, children develop at different speeds and may reach developmental milestones at different times. What is considered 'normal' child development also varies across cultures and environments, since expectations and parenting strategies may differ between countries as well as among cultural, ethnic or religious groups within the same country. Learning and the acquisition of skills across an individual's life course are built on the foundational capacities established during the early years. Scientific evidence, particularly from the neurosciences, confirms that the first few years of life are critical periods of human development in which children are highly sensitive and responsive to environmental influences." (Loizillon, Petrowski, Britto, & Cappa, 2017)

The development of the ECDI followed methodological guidelines for instrument development and used a multi-stage, multi-method approach. [12]

11 The predictors will be discussed in the relevant section of the results analysis.
12 For additional information see: (Loizillon, Petrowski, Britto, & Cappa, 2017).

**Table 3. Construction of the individual domain scores and total ECDI**

*Source: UNICEF [17], MICS4 Child Development Tabulation Plan, CD*

**Responses to questions EC8–EC17 are used to determine whether children are developmentally on track in four domains:**

**(1) Literacy-numeracy: Developmentally on track if at least two of the following are true: EC8=1 (Can identify/name at least ten letters of the alphabet), EC9=1 (Can read at least four simple, popular words) and EC10=1 (Knows the name and recognizes the symbol of all numbers from 1 to 10);**

**(2) Physical: Developmentally on track if one or both of the following are true: EC11=1 (Can pick up a small object with two fingers, like a stick or a rock from the ground) and EC12=2 (Is not sometimes too sick to play);**

**(3) Social-emotional: Developmentally on track if at least two of the following are true: EC15=1 (Gets along well with other children), EC16=2 (Does not kick, bite or hit other children) and EC17=2 (Does not get distracted easily);**

**(4) Approaches to learning: Developmentally on track if one or both of the following are true: EC13=1 (Follows simple directions on how to do something correctly) and EC14=1 (When given something to do, is able to do it independently);**

**Total ECDI: Percentage of children who are developmentally on track in at least three of the four domains (literacy-numeracy, physical, social-emotional and approaches to learning).**

# G. DATA ANALYSIS

In the data analysis section of the report the usage of electronic devices by child will be analysed from the perspective of both, the dependent and the independent variable, to determine both the underlying causes and its potential consequences. The four main section will be differentiated below, where we will discuss the results of the data analysis by (1) contextual factors; (2) household factors; (3) caregiver's characteristics and (4) child's characteristics.

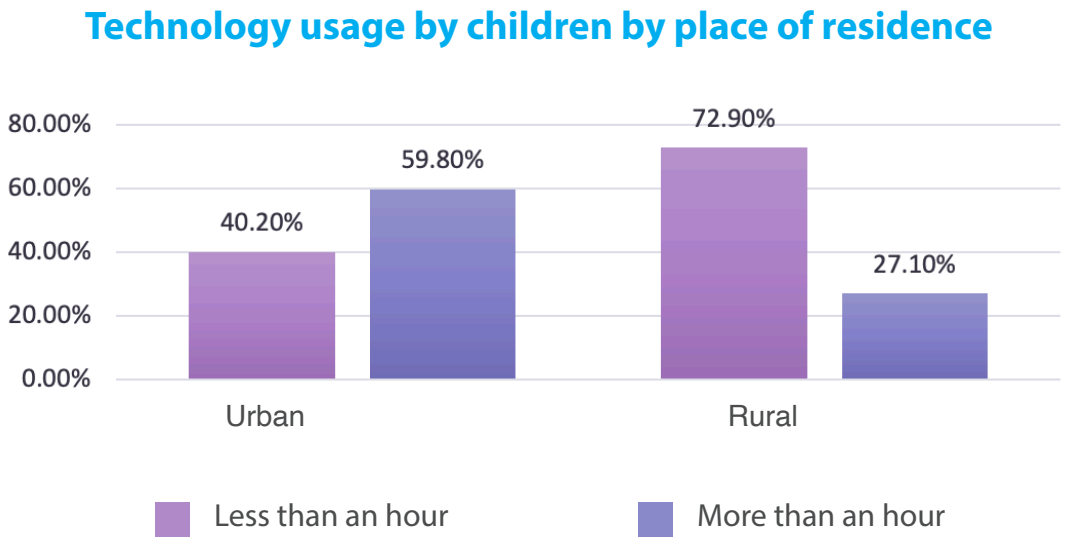
## (1) CONTEXTUAL FACTORS

### Urban living

Typically, numerous studies confirm that the access of urban dwellers to various technological resources is higher than that of rural dwellers. This is a result of the different socio-economic backgrounds between the rural and the urban areas. In view of the above, we assessed whether we had a different picture in terms of the frequency of use of technology in rural and urban children. We have a similar picture as a result of analysing our data.

The difference between the frequency of use of electronic devices between children from urban and rural areas is statistically significant (X2 (1, N = 2535) = 45.626, P < 0.001). Children living in urban areas use technology more often than children living in rural areas (see Figure 3).

**Figure 3. Usage of technology by children aged 2–5 years by place of residence**




*χ2 (1, N=2536) = 45.626, p<0.01*[13]

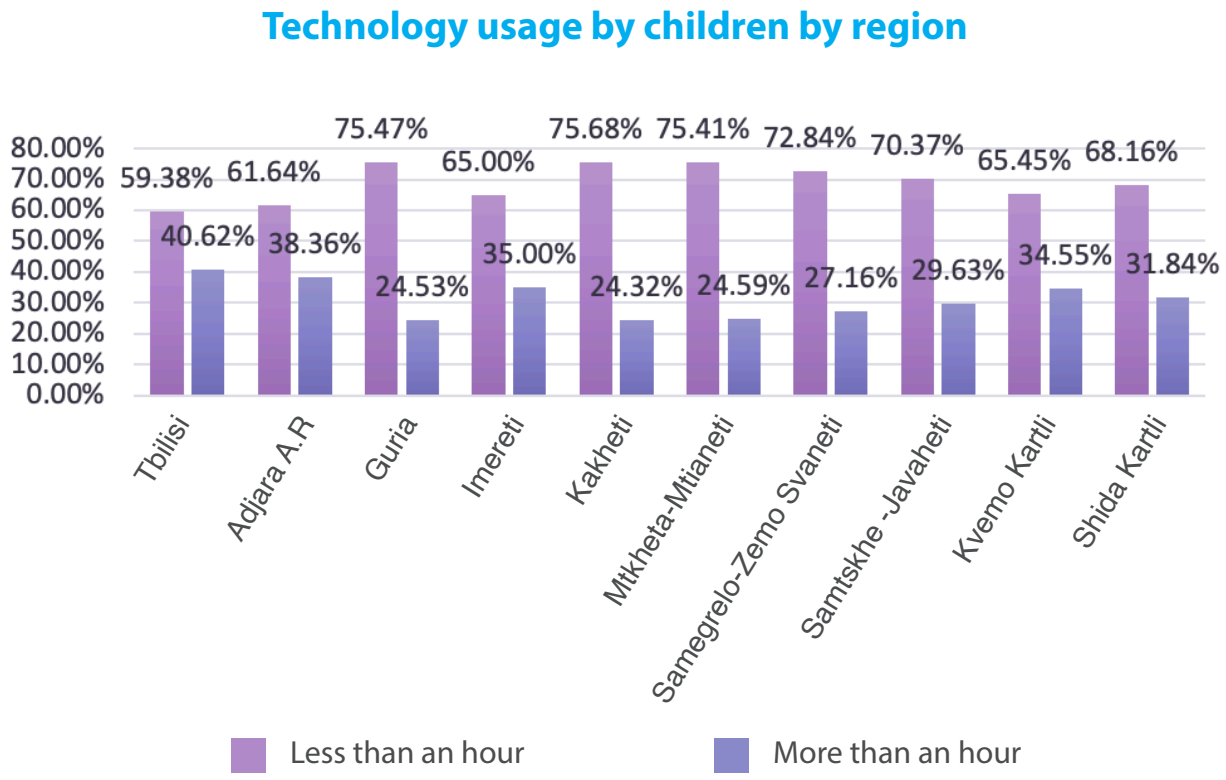
13 Interpreting these per cent without observing the number of children in each category is not recommended. See the table for full details in the appendix 1.

It's worth mentioning that a statistically significant difference between urban and rural children is maintained even after we add other relevant predictors to the model, such as household characteristics, household wealth index, ethnicity and internally displaced persons status of the household head. Apparently, household wealth index and other characteristics of the household explain part of the differences between the frequent and less frequent usage of technology by children, but the most powerful predictor between the above-mentioned ones remains the place of residence—whether the child lives in an urban or a rural area.

## REGIONS

The frequency of use of electronic devices by children was also assessed by regions of Georgia. As it turned out, the difference between the regions is statistically significant, but at the expense of Tbilisi. This means that when we put Tbilisi as a reference category, only then was the difference with other regions observed. For children living in Tbilisi, compared to those living in other regions, the probability that they will use electronic devices for more than one hour a day increases by 1.4 times (see Figure 4).

Figure 4. Usage of technology by children aged 2–5 years by region




*χ2 (9, N=2536) = 34.445, p<0.01*

It is obvious that the general tendency is for children to use electronic devices for less than an hour a day. This pattern is maintained in all regions of Georgia. Observed result is somehow acceptable for the target age group (2 to 5 years old), according to the recommendations of paediatric associations. [14] The highest rate of the usage of technology by children for more than one hour a day after Tbilisi (41%) was reported in Adjara (38%), Imereti and Kvemo Kartli (35% in each).

Considering that the minimum difference between the regions (except Tbilisi, the capital of Georgia) was revealed, we recoded the region variable into two categories, Tbilisi and all other for the next statistical models.

Finally, a logistic regression was performed to ascertain the joint effect of contextual factors (urban, rural or regional) on the likelihood that the child will use electronic devices or watch television more than one hour a day. The logistic regression model was statistically significant ($\chi 2(10) = 57.81$, $p < .0001$). The model explained 3 per cent (Nagelkerke R2) of the variance in the usage of electronic devices by children and correctly classified 64.9 per cent of cases. That is a small part of the total variation of dependent variable. Therefore, it is important to search for other, more critical predictors and add them to the model. Only urban living was statistically significant predictor of the usage of electronic devices or television by children aged 2–5 years in the joint contextual model. Children from urban areas were 1.647 times more likely to use electronic devices for more than one hour a day than children from rural areas. The regional factor was statistically insignificant predictor in this model. It seems that in our case, children from all regions were using electronic devices or watching TV during the day with equal frequency, when we control for the urban living aspect. In other words, the frequency of children using electronic devices by regions of Georgia according to the joint model does not differ statistically significantly. Relationship between the regions of Georgia and the use of electronic devices by children is a function of urban living.

## (2) Household factors

The characteristics we combined into household factors are as follows: household wealth, ethnicity and internally displaced person status of household head, [15] household size and density (mean number of household member per bedroom), existence of other children at home, existence of grandparents at the household, and household asset. Here we note that the coexistence of grandparents and children aged 5–17 years old in the household are not factors associated with the time a child spends with electronic devices.

## HOUSEHOLD WEALTH INDEX QUANTILES

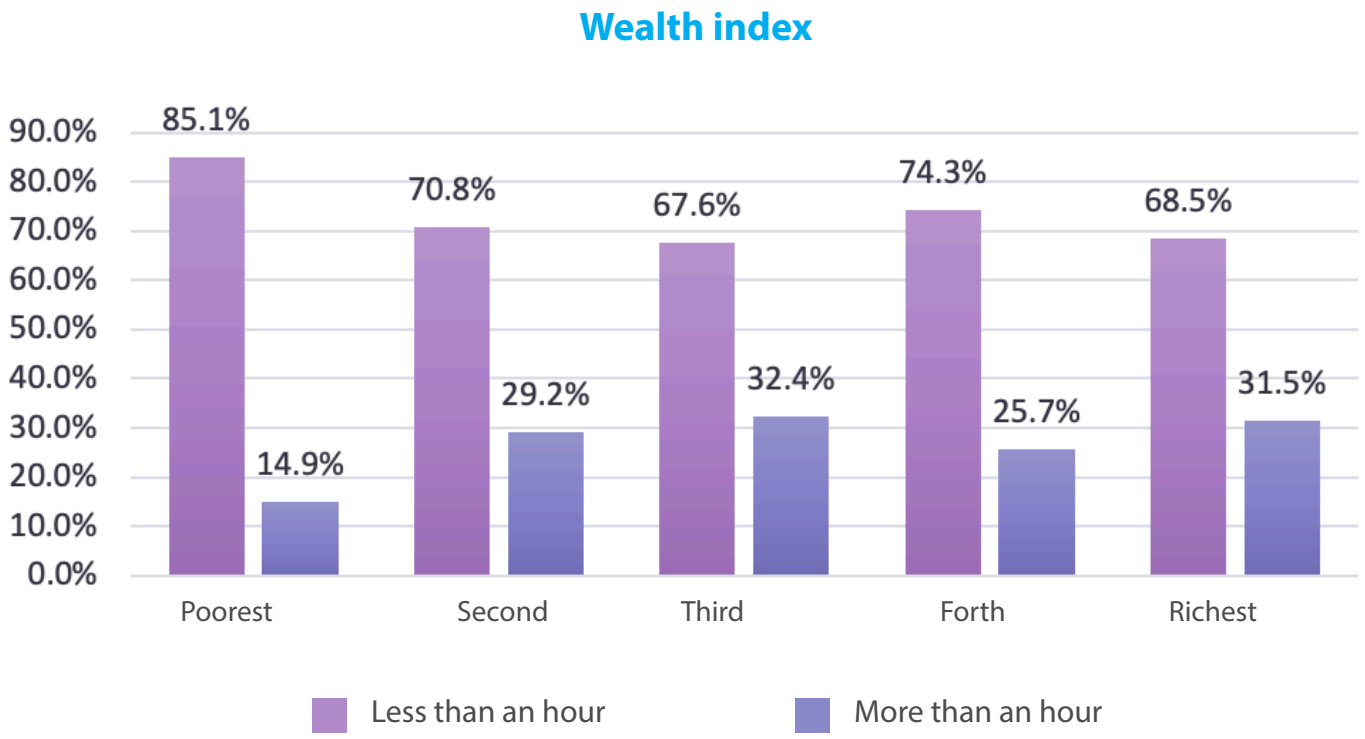
Information on the wealth index is based on data collected in the household questionnaire. Wealth index includes questions concerning the household's ownership of a number of consumer items, such as a television and car; dwelling characteristics, such as flooring material; type of drinking water source; toilet facilities; and other characteristics that are related to wealth status. Households are differentiated in five main categories by wealth indexes, namely: Lowest, second, middle, fourth and highest. "The wealth index is particularly valuable in countries that lack reliable data on income and expenditures, which are the traditional indicators used to measure household economic status." [16]

14 See details in the recommendations section.
15 Ethnicity and internally displaced persons status of household head are not statistically significant predictors of the frequency of the usage of technologies by children. This means that children from internally displaced persons and non-internally displaced persons families play with electronic devices with equal frequency during the day. As well as children living in families of different ethnic backgrounds. In this section we will focus only on the statistically significant predictors.
16 Source: *https://dhsprogram.com/topics/wealth-index/index.cfm*

Given that the wealth index includes information on whether a household member has a computer, TV, smartphone, tablet, internet and electricity access and so on, it is expected that the frequency of the usage of electronic devices by children will increase with the increase of the wealth index.

The figure below illustrates the variation of the children's usage of technology by the household's wealth index. The main tendency is the usage of technology by children for less than one hour a day (see Figure 5). The pattern remains the same for households from all five quantiles of wealth index.

**Figure 5. Usage of technology by children aged 2–5 years by household wealth index**




*χ2 (4, N=2536) = 18.562, p<0.01*

For households in the first category, the percentage of children who consume technologies for more than one hour is the smallest. In the third and fifth categories of wealth index, 32 per cent of children used technologies for more than an hour a day and it's the highest rate. Difference in the usage of electronic devices by children aged 2–5 years is statistically significant by the family wealth index ($\chi 2$ (4, N = 2535) = 18.562, P < 0.01). The higher the family wealth index, the greater the chance that children will use electronic devices for more than an hour during a day.

A logistic regression was performed to ascertain the effects of household's factors (internally displaced person status, wealth score and ethnicity) as a joint model on the likelihood that the child will use electronic devices or television more than one hour a day. The logistic regression model was statistically significant ($\chi 2(3, N=2535) = 47.79$, $p < 0.001$). The model explained 0.026 per cent (Nagelkerke R2) of the variance in the usage of electronic devices by children and correctly classified 64.9 per cent of cases. It is worth mentioning that this is a very small part of the total variation of dependent variable. Therefore, the statistical model is poor and we need to check for the powerful predictors. Wealth was statistically a

significant predictor of the usage of electronic devices or television by children aged 2–5 years old. With an increase in wealth score by one standard unit, the probability that a child will use electronic devices for more than one hour a day increases 1.413 times (Almost one and a half times). In other words, increasing wealth score was associated with an increased likelihood of the usage of electronic devices for more than an hour a day. Ethnicity and internally displaced person status of household's head were not statistically significant predictors of the usage of electronic devices by children.

Internally displaced person status of household's head becomes statistically significant predictor of the usage of technologies by children when we added child's age in the model. Model explains 21 per cent (Nagelkerke R2) of the variation of the dependent variable and correctly classifies 69 per cent of cases. Both predictors have statistically significant effect on the usage of electronic devices by children ($\chi 2(3, N=2536) = 412.927, p < 0.001$). The probability that children from households whose head has the internally displaced person status will use electronic devices for more than one hour during the day increases 1.8 times when other variables (child's age) remains constant. As for age, a one unit increase in children's age increases the probability that the child will use technology for more than one hour a day by 1.1 times.

## HOUSEHOLD SIZE AND DENSITY

In Georgia MICS 2018, the number of family members is a statistically significant predictor of the usage of electronic devices by children but only marginally. The more members there are in the household, the less likely it is that the child will use the technology for more than an hour a day. This may be due to the fact that as the number of family members increases, the child is more likely to be under adult supervision, which to some extent precludes the fact that he or she will frequently use electronic devices during the day. In the process of analysing the data when we control for the contextual and other household characteristics, as well as child characteristics, the impact of the number of family members on the frequency with which a child uses electronic devices becomes statistically insignificant. The older a child gets, the more he or she wants to do different activities independently of family members. This may be one of the reasons why the effect of the number of family members due to the age of the child became insignificant.

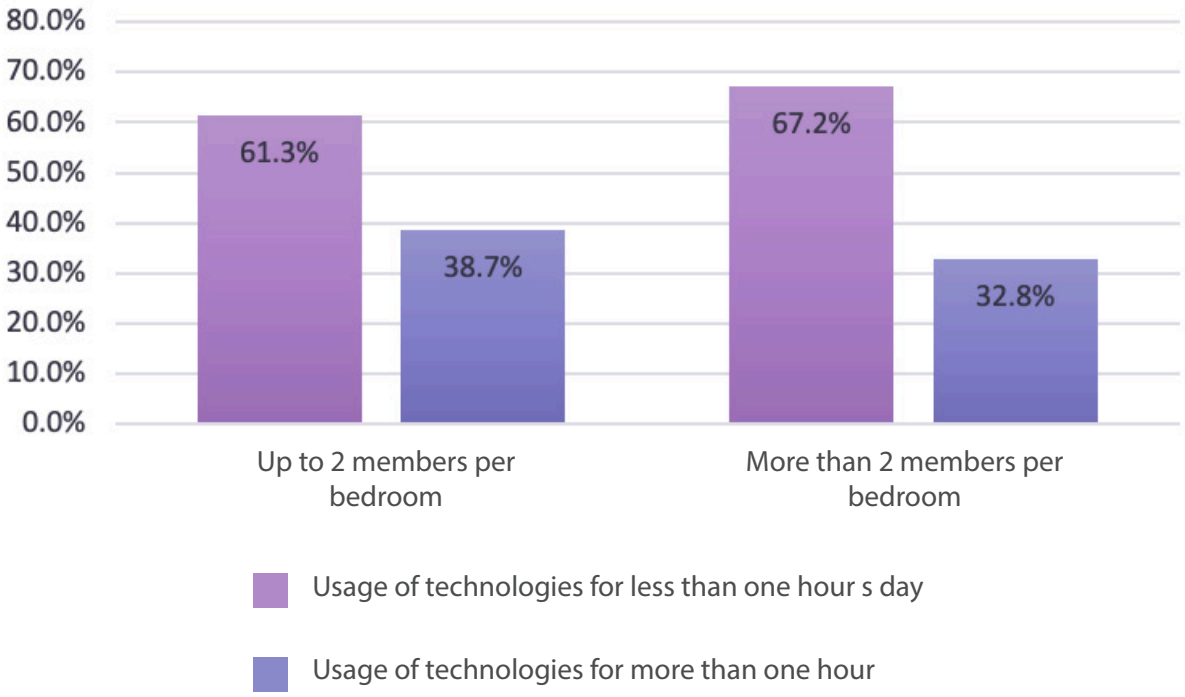
The total model explains 24 per cent of the variation of the dependent variable and correctly classifies 70per cent of cases. The statistically significant predictors in this model are: Urban living, wealth score, internally displaced person status of household's head and child's age. Child's age is the best predictor of the usage of electronic devices by children (Wald $\chi 2=346.5$, while the coefficients of other statistically significant predictors doesn't exceed 10 units). The older the child is, the higher the risk of using electronic devices for more than 1 hour.

Household density is the stronger factor associated with the use of technologies by children, than the number of household members (household size). We computed the household density variable according to the following algorithm: Divided the number of household members by the number of rooms used for sleeping in the household. Households have been grouped in two categories: Maximum two members per bedroom, more than two members per bedroom.

In households where two or less people sleep per bedroom 39 per cent of children play with electronic devices for more than one hour. In families where more than two people sleep per bedroom, 33 per cent of children use technologies for more than one hour a day. Difference between the proportions is statistically significant ($\chi 2(1, N=2536) = 9.078, p < 0.01$) (see Figure 6).

**Figure 6. Usage of technology by children aged 2–5 years by household density**

## Household density




*χ2 (1, N=2535) = 9.078, p<0.01*

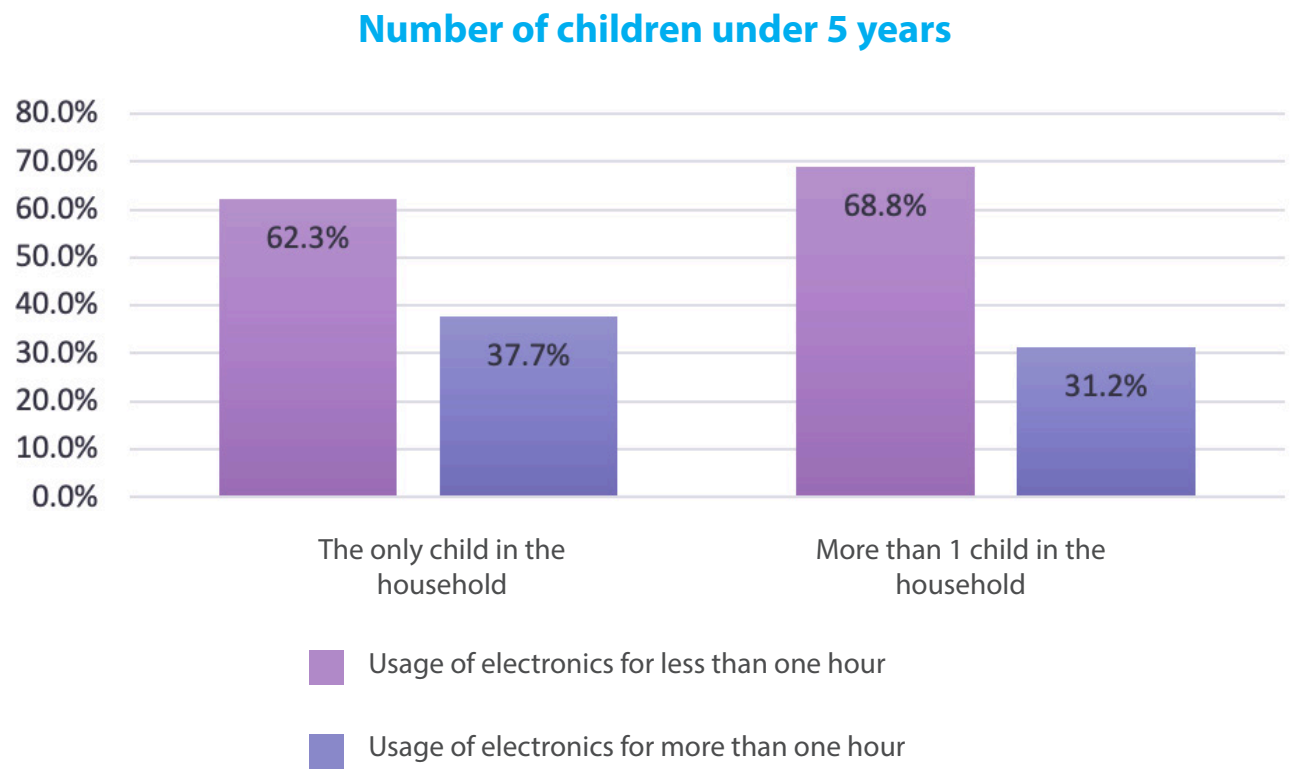
Analysis illustrates that in crowded households the number of children who use electronic devices for more than one hour a day reduces.

A logistic regression was performed to ascertain the joint effect of household density with contextual and household factors on the likelihood that a child will use electronic devices or watch television more than one hour a day. The logistic regression model was statistically significant ($\chi2(1, N=2535) = 4.67, p < 0.05$). The model explained 3 per cent (Nagelkerke R2) of the variance in the usage of electronic devices by children and correctly classified 65 per cent of cases. That is a very small part of the total variation of dependent variable. Therefore, it is important to search for other more critical predictors and add them to the model. Urban living, household wealth score and household density were statistically significant predictors of the usage of electronic devices or television by children aged 2–5 years in the joint model. Children from urban area used electronic devices more frequently than children from rural areas. Association between family wealth score and a child's usage of technologies is positive: increase in wealth associated with an increase in the frequency of usage of technologies by children. As for density, association between these two variables remains negative and statistically significant after controlling for the contextual and household's characteristics. This means that in more crowded households the probability that children will use electronic devices for more than one hour a day decreases 0.83 times. It is worth mentioning that the effect of density becomes statistically insignificant after controlling for child's age. This means that the association between the household density and the usage of electronic devices by children can be a function of children's age. The older a child gets, the less the household density affects the frequency of the usage of electronic devices by children, as it was the case with the number of household members.

## NUMBER OF CHILDREN UNDER FIVE YEARS OF AGE IN A HOUSEHOLD

The results of the data analysis suggest, that the presence of other children under the age of five in the household is associated with low frequency of electronic device usage by children. In the households with only a single child, the likelihood that children will use electronic devices for more than an hour a day increases by 1.337 times compared to the households with more than one child $\chi2(1, N=2536) = 11.575$, $p < 0.01$). The figure below illustrates the per cent of children who use electronic devices for more or less than one hour a day by the presence of another child in the household. As it seems, only 31 per cent of children use electronics for more than an hour a day from households where two or more children under the age of five live. Whereas, in households where there is only one child, 38 per cent of children use electronics for more than an hour a day. Difference between the proportions remain statistically significant ($\chi2(1, N=2536) = 11.434$, $p < 0.01$) (see Figure 7).

**Figure 7. Usage of technology by children aged 2–5 years by the number of children under five in the household**




*$\chi2$ (1, N=2535) = 11.434, p<0.01*

A logistic regression was performed to ascertain the joint effect of the number of children under five years of age living in the household with contextual, household and child related factors on the likelihood that a child will use electronic devices or watch TV for more than one hour a day. The logistic regression model was statistically significant ($\chi2(1, N=2535) = 7.067$, $p < 0.01$). The model explained 23 per cent (Nagelkerke R2) of the variance in the usage of electronic devices by children and correctly classified 70 per cent of cases. The effect of the number of children under five years in the household remained statistically significant even after we controlled for the contextual (urban living), household (internally displaced person status and wealth score) and child (age) factors, however the effect was slightly reduced (became 1.289 from 1.337—if we round coefficient to the nearest tenths, we can say that the effect has not changed at all).

To sum up, the presence of other children under five years of age in the household is associated with a low frequency of the usage of electronic devices by the children. In the households with only one child, the likelihood that children will use electronic devices for more than an hour a day increases compared to the households with more than one child. This result can be explained in two ways: on the one hand, it is possible that when there are two or more children under the age of five in the family, they can easily find a common language, do not have difficulty playing together and have less time for electronic devices. On the other hand, this may be due to the socio-economic background. In households with more than one child under the age of five, gadgets may be less accessible to children for long periods of time due to more or less limited resources. One way or another, this result somewhat narrows the target audience for further interventions and places special attention on families where one child under the age of five is growing up.

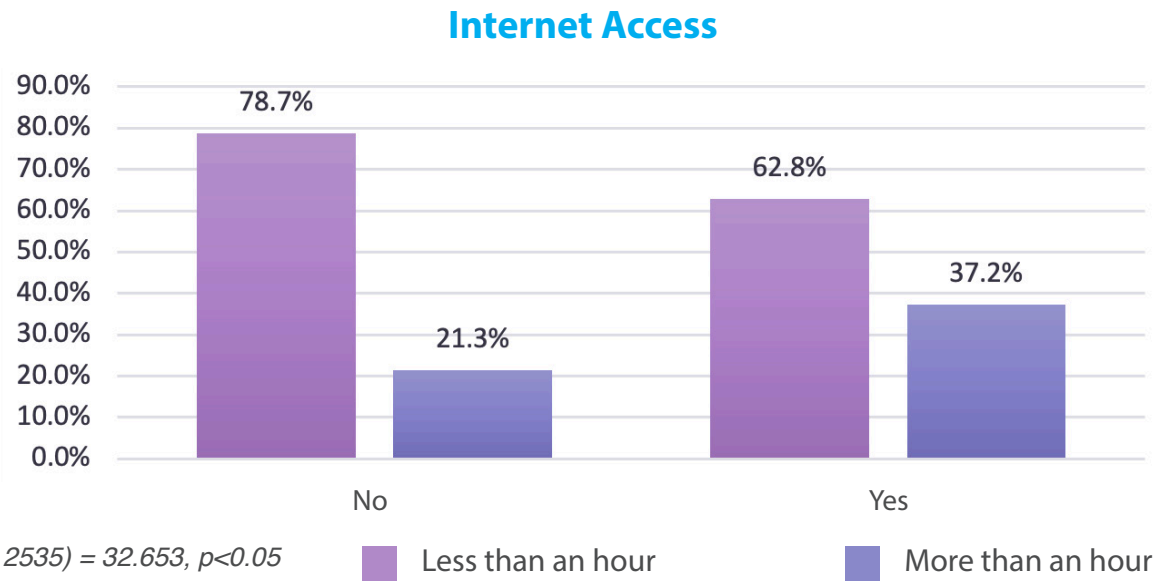
However, it would be interesting to study in depth the association between the number of children approximately of the same age in the households and the frequency of the electronics usage by children under five years of age. Especially considering how much time kids spend together and what activities they do while they are together. It should also be noted here that in the future it is important to evaluate not only the frequency of the usage of gadgets by children, but also the content, i.e. what type of content children interact with through gadgets. Without this information, the likelihood of developing effective recommendations based specifically on the results of reliable and valid research conducted on the target population is minimized. This is an interesting extension of research in the future.

## HOUSEHOLD ASSET

In Georgia MICS 2018 in the households questionnaire, we can assess if a household has electricity, internet access, TV, computer, smartphone, etc. The frequency of usage of electronic devices by children was also assessed by the extent to which children had an access to the above mentioned types of household assets. All 100 per cent of the households of the children surveyed had access to electricity, therefore, the analysis of the difference according to this characteristic was meaningless. As for access to the other goods listed above, we obtained absolutely logical results from the data analysis. For those, who has access to electronic devices and internet, the probability of using them for more than one hour almost doubles in all cases. The result is maintained even after taking into account the contextual, household and child factors.

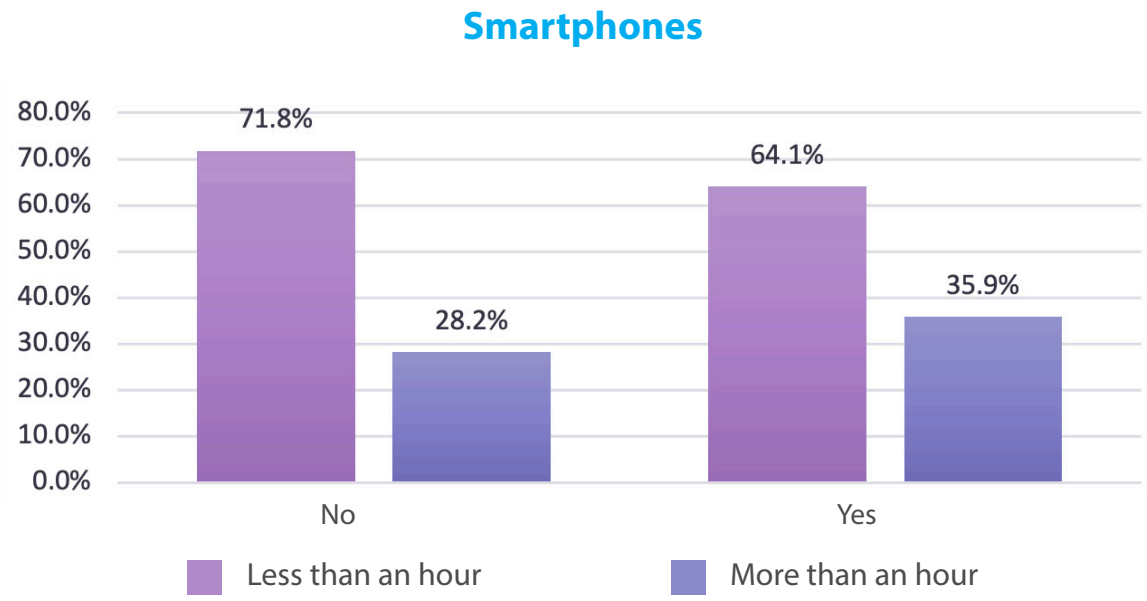
The figures below sheds light on the per cent of children who used electronics for more than one hour a day and by access to each type of the mentioned asset (see Figures 8, 9, 10 and 11).

***Figure 8. Usage of technology by children aged 2–5 years by access to internet in the household***



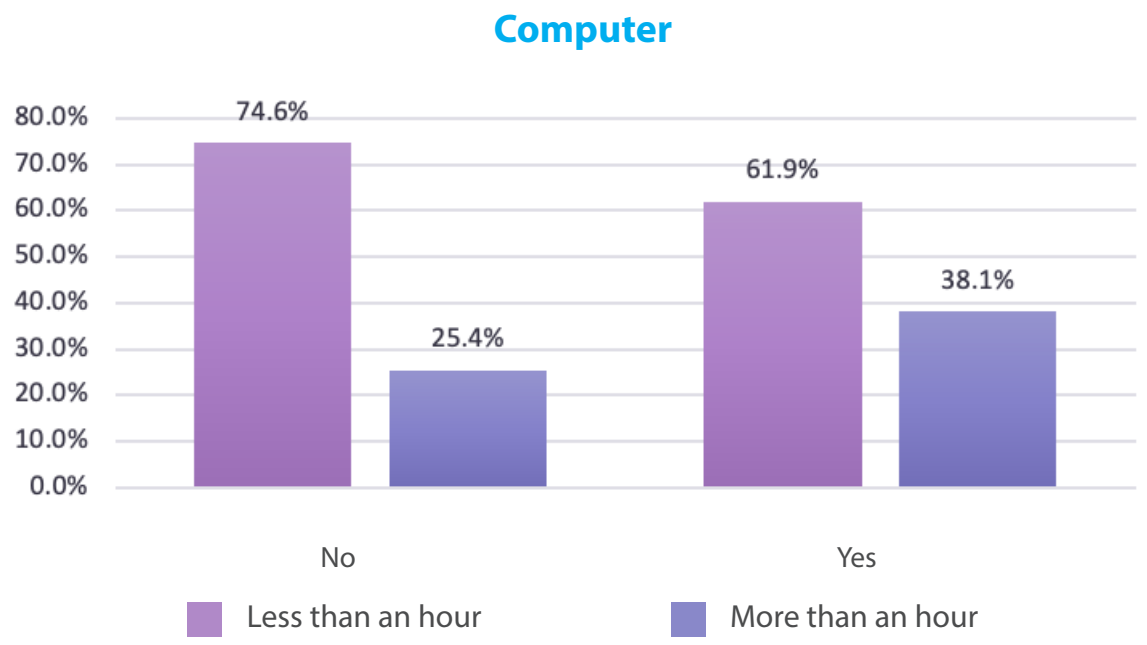

*χ2 (1, N= 2535) = 32.653, p<0.05*

**Figure 9. Usage of technology by children aged 2–5 years by availability of smartphones in the household**



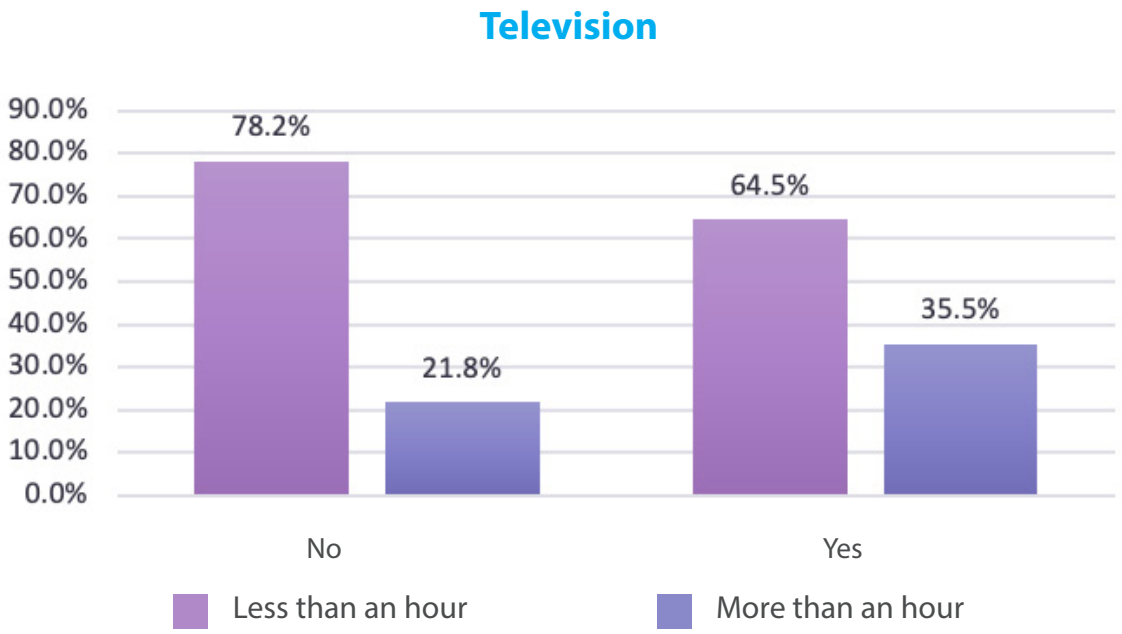

*χ2 (1, N=2535) = 5.930, p<0.05*

**Figure 10. Usage of technology by children aged 2–5 years by availability of computers in the household**




*χ2 (1, N=2535) = 32.992, p<0.05*

**Figure 11. Usage of technology by children aged 2–5 years by availability of TV in the household**




*χ2 (1, N=2535) = 6.227, p<0.05*

It is clear that the general trend is for children to use electronic devices for less than one hour a day, however, among those who use them for more than one hour, the percentage of children who have access to various technological devices at home prevails. The difference between them is statistically significant.

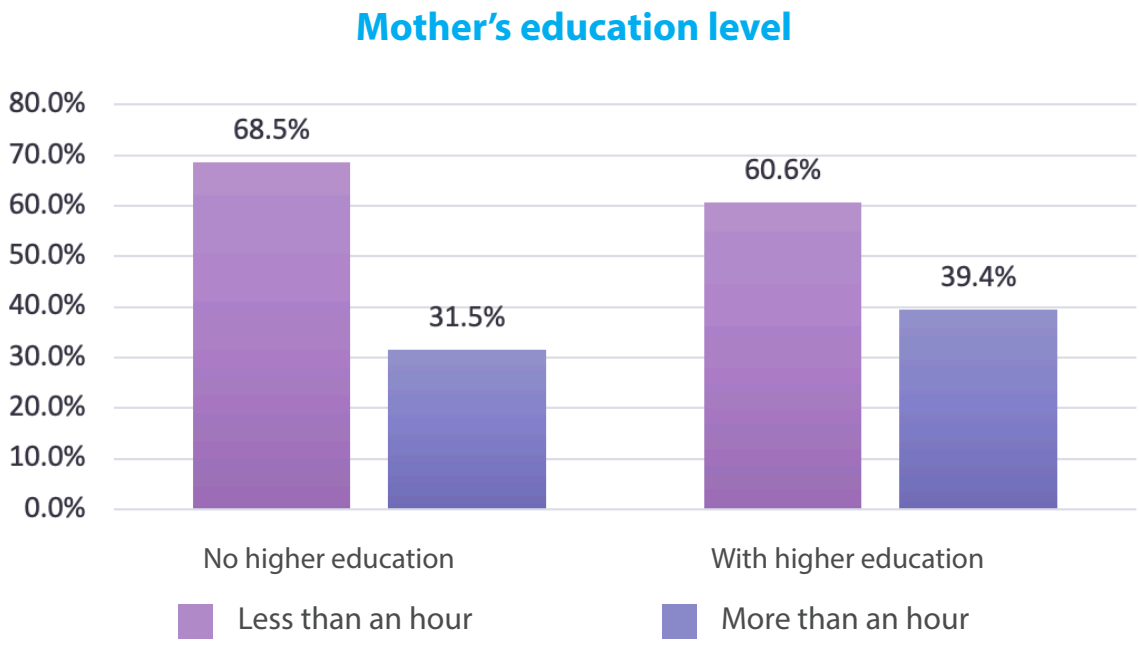
## (3) Caregiver's characteristics

Under the term of the characteristics of a caregiver, we combined the mother's education, age, functional disability status and attitudes toward physical violence. In this section, we will also discuss the parenting practices and the supervision of children, as well as the effects of violence if any. The only statistically significant factor from the characteristics of the mother that is associated with the frequency of use of electronic devices by the child is a mother's education. Neither the age of the mother, nor her functional disability status or her attitude toward physical violence are statistically significantly correlated with the frequency with which children use electronic devices. In our sample, the association between inadequate supervision[17] of the child and the frequency with which he or she uses electronic devices is statistically insignificant. This means that in our sample, it is less possible to predict the frequency of technology use by children based on these factors. Given the lack of variation, we reduced the five dimensions of maternal education to two, namely, by education we divided mothers into two groups: (1) Mothers who did not have higher education and (2) Mothers with higher education. For further analysis we used this type of modified variable.

As the figure below illustrates, 39 per cent of children whose mother have higher education used electronic devices for more than one hour a day, compared to the 32 per cent of those children whose mother did not completed higher education. The difference between the proportions is statistically significant (see Figure 12).

17 Leaving a child without appropriate supervision (for example, leaving them alone or in the care of a child under 10 years)

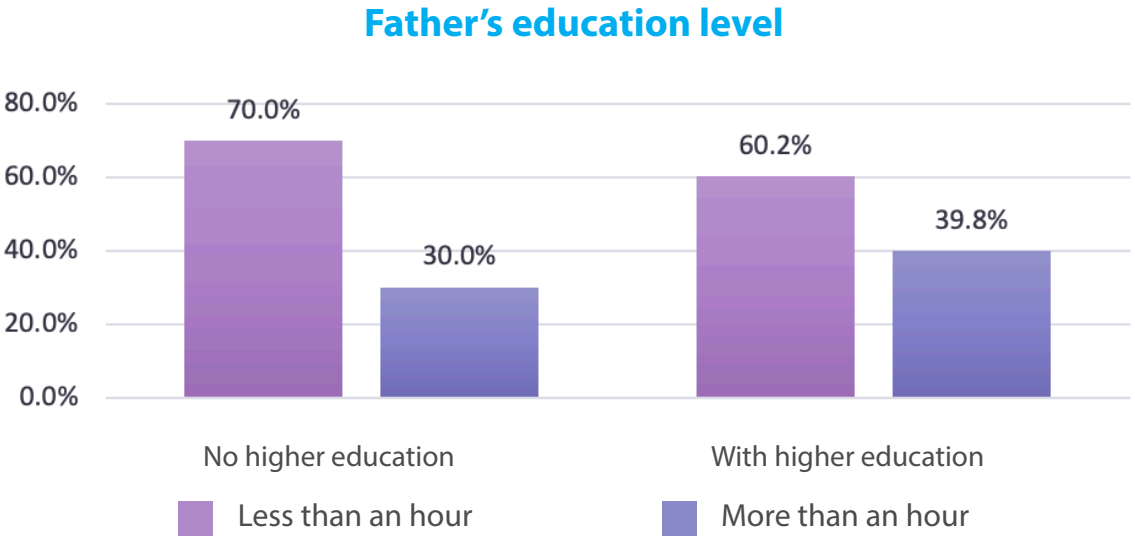
**Figure 12. Usage of technology by children aged 2–5 years by mother's education level**




*χ2 (1, N=2535) = 17.330, p<0.05*

Absolutely the same pattern of association revealed when we replaced mother's education with father's education (see Figure 13).

**Figure 13. Usage of technology by children aged 2–5 years by father's education level**




*χ2 (1, N=2220) = 23.295, p<0.001*

A logistic regression was performed to ascertain the effects of mother's characteristics (education level, functional disability status, attitudes about child's physical punishment) on the likelihood that the child will use electronic devices or watch television more than one hour a day. The logistic regression model was statistically significant ($\chi 2(6, N=2535) = 20.208$, $p<.001$). The model explained 0.023 per cent (Nagelkerke R2) of the variance in the usage of electronic devices by children and correctly classified 56.5 per cent of cases. The only statistically significant predictor of the usage of electronic devices was mother's education. The children of mothers who have higher education were 1.518 times more likely to use electronic devices or watch TV for more than one hour a day, than the children of mothers who do not have a higher education.

The same statistically significant association revealed between the father's education and the usage of electronics by children. Association remained even after we controlled for the contextual, household and child related factors. For children whose fathers have higher education, the probability of using electronic devices for more than one hour during the day increases 1.311 times ($\chi 2(1, N=2535) = 23.147$, $p<.001$).

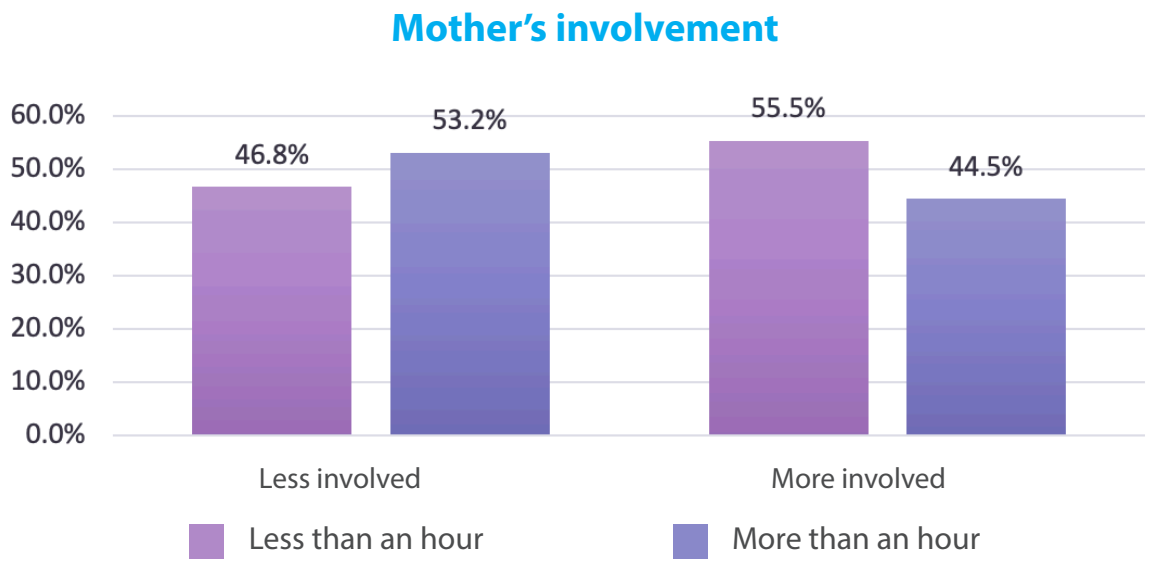
The results of the study show that when analysing the education of the father and mother together, the education of the mother loses a statistically significant impact on the usage of electronics by children. However the effect of father's education remains statistically significant.

## PARENTAL INVOLVEMENT

In Georgia MICS 2018 parental involvement and early childhood stimulation and care was measured. The mentioned construct included the involvement of adults in the household with children in the following activities: reading books or looking at picture books; telling stories; singing songs; taking children outside the home, compound or yard; playing with children; and spending time with children by naming, counting, or drawing things. Caregivers were asked if they were engaged in the listed activities during the last three days.

The analysis found that a statistically significant association exists only between maternal involvement and the frequency with which children use electronic devices. The involvement of the father and other adults in our case are not factors associated with the frequency of use of electronics. We recoded the involvement variable into a two-dimensional one, where we grouped those mothers who engaged in three or less activities and those who were involved in four or more activities. Comparison of the frequent use of electronics by children in the two mentioned categories illustrates statistically significant differences. Differences remain even after we controlled for factors of urban living, internally displaced person status of household head, family wealth score and child's age. The more engaged mother is, the likelihood that the child will use electronics for more than an hour a day decreases .660 times when all listed variables remain constant. (see Figure 14).

**Figure 14. Usage of technology by children aged 2–5 years by mother's involvement**




*χ2 (1, N=2220) = 11.638, p<0.01*

This makes it clear that the per cent of children who used electronic devices for more than one hour a day is less in the category of more involved mothers. Difference is statistically significant.

## NUMBER OF CHILDREN BOOKS AND ACCESS TO TOYS FROM SHOPS

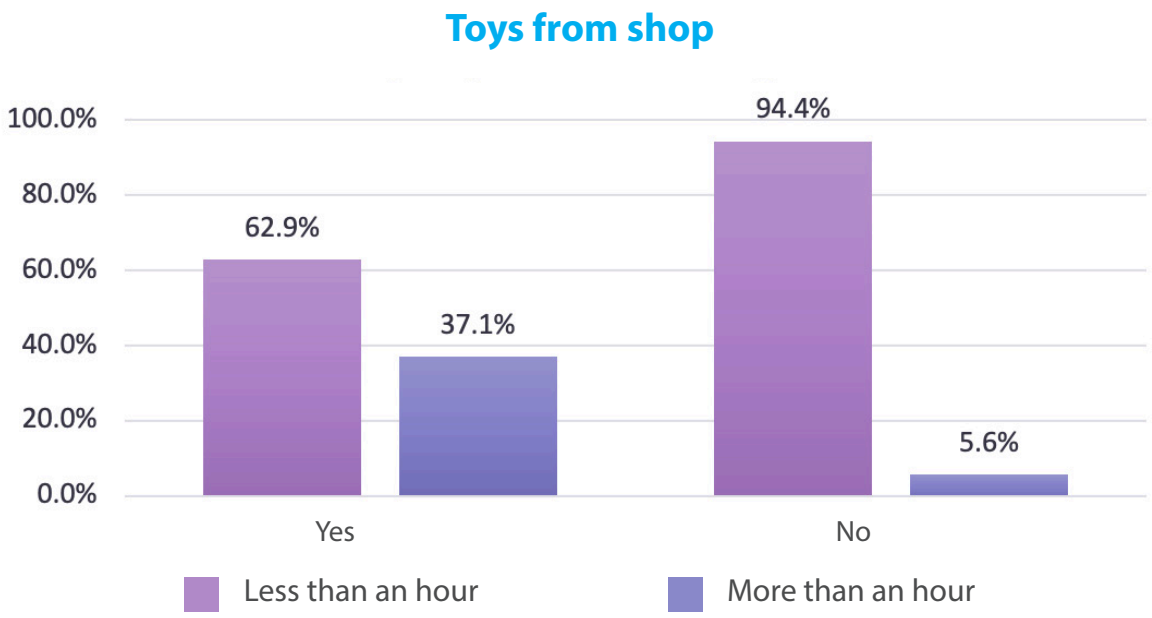
In Georgia MICS 2018 parents were asked about how many children's and picture books the child has, whether the child has toys from a shop or home-made toys? As a result of the data analysis, the number of children's books at home is positively associated with the frequent use of electronic devices by children. In other words, the more children's books a child has, the more often he or she uses electronic devices. Association remains statistically significant even if we control for the standard variables related to the context, household and child characteristics.

There is a positive relationship between the presence of toys from shop and the frequency of use of electronic devices by children. With presence of toys from shop, the likelihood that children will use electronic devices longer than one hour a day also increases 3.6 times ($\chi 2(1, N=2535) = 16.924, p<.001$).

These results can be explained by the fact that in households where caregivers can buy children's books and picture books and toys in the store, the frequency of use of electronic devices is more a function of access to a financial resources in the household.

The figure below illustrates that 94 per cent of those children who didn't have toys from shop, used electronic devices for less than an hour a day. On the other hand, only 63 per cent of those children who had access to the toys from shop used electronic devices for less than an hour a day.

**Figure 15. Usage of technology by children aged 2–5 years by accessibility to toys from shop**




*χ2 (1, N=2220) = 11.638, p<0.01*

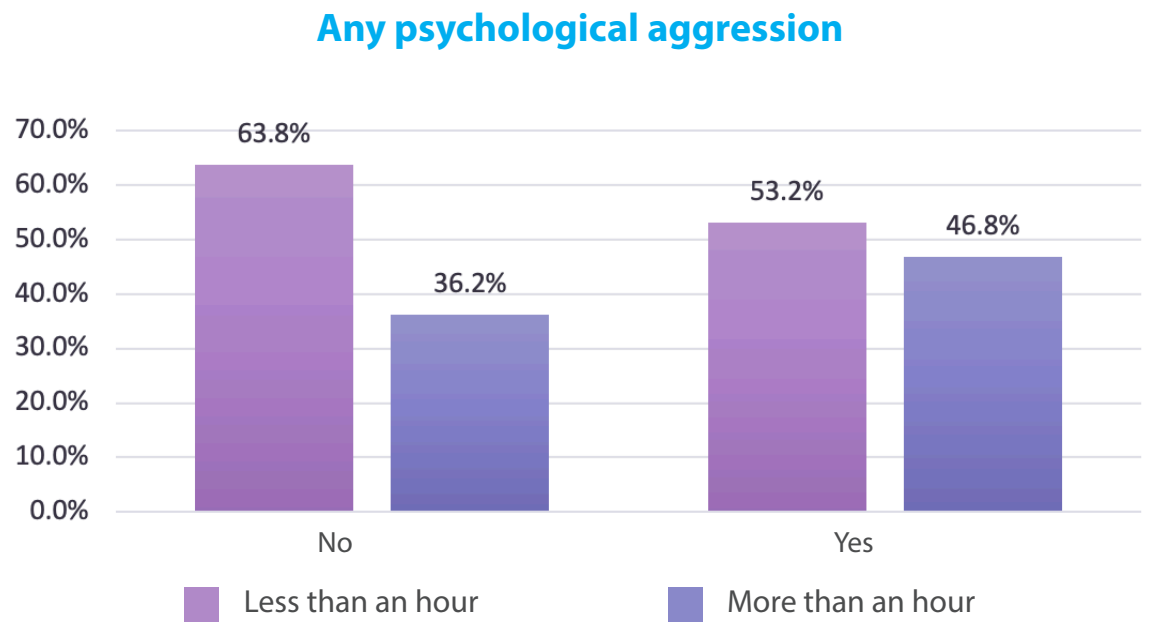
## DISCIPLINARY PRACTICES

An extensive report was devoted to the practice of child discipline and violence in Georgia MICS 2018. The practice of violence was also assessed as part of our key issue. Detailed information on this content can be found in the report on child discipline. In this study, we present information only about the associations between the variables.

In the 2018 Georgia MICS mothers or caretakers of children under age five were asked a series of questions on the methods adults in the household used to discipline the child during the past month. There were four dimensions differentiated in the MICS child discipline scale namely: non-violent discipline, psychological aggression, physical punishment and severe physical punishment. We assessed whether there was an association between forms of discipline practice and the frequency with which a child used electronic devices.

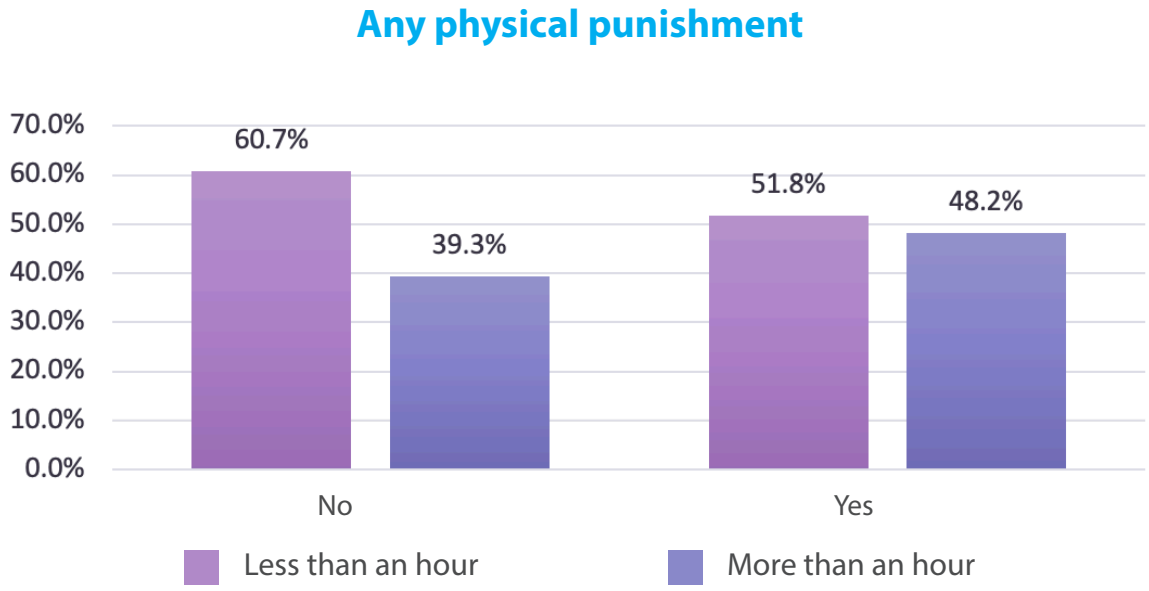
In the case of children experiencing psychological aggression, the likelihood that the child will use electronic devices for more than one hour a day increases 1,573 times. The association has a similar pattern in the case of physical violence (see Figures 16 & 17). In the case of children who experience physical violence, the likelihood that a child will use electronic devices for more than one hour a day increases 1,512 times. In both cases, the difference remains statistically significant, albeit slightly decreasing, even after controlling for other characteristics (urban living, internally displaced person status, wealth score and child's age).

**Figure 16. Technology use in children aged 2–5 years when experiencing psychological aggression**




*χ2 (1, N=2220) = 23.009, p<0.01*

**Figure 17. Technology use in children aged 2–5 years when experiencing physical punishment**

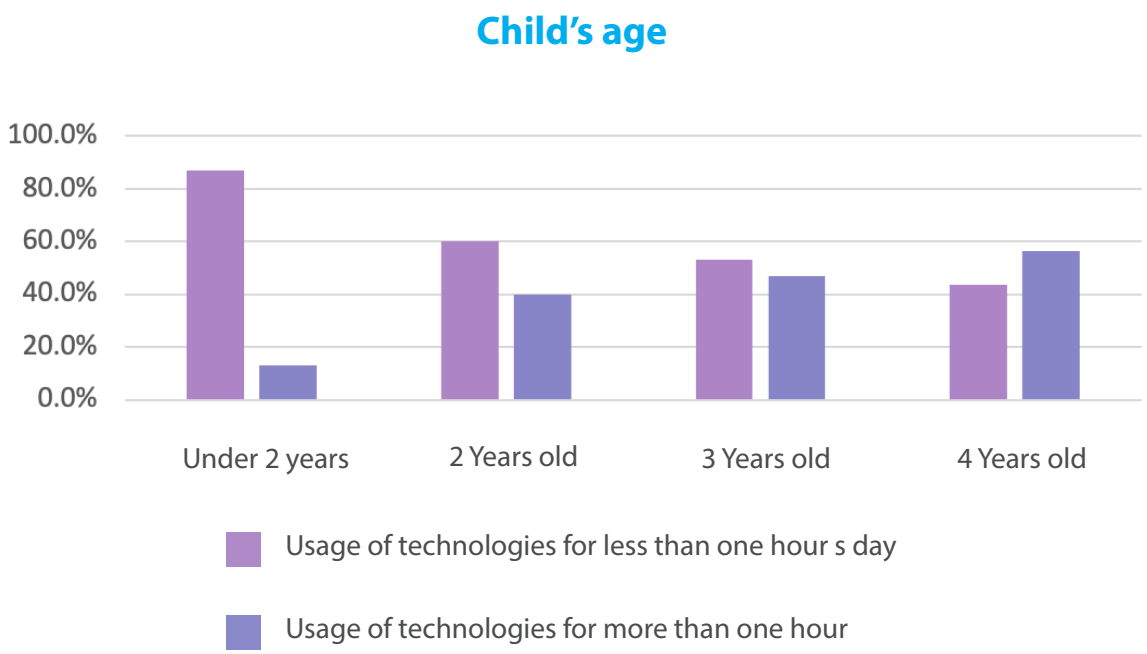



***χ2 (1, N=2220) = 15.301, p<0.01***

## (4) Child's characteristics

In the child's characteristics we include child age, gender, disability status, whether he/she attended early childhood education programme (ever, anytime since the beginning of current school year, or currently), whether he/she attended public or private kindergarten, and anthropometrics. [18] The only statistically significant predictor of the usage of electronic devices by children was child's age. With each passing age category, the number of children who used electronic devices for more than an hour increased (see Figure 18). The same result was obtained by regression analysis, increasing age was associated with an increased likelihood of the usage of electronic devices or television for more than one hour a day.[19]

**Figure 18. Usage of technology by children by the child's age**




*χ2 (3, N=2534) = 350.822, p<0.001*

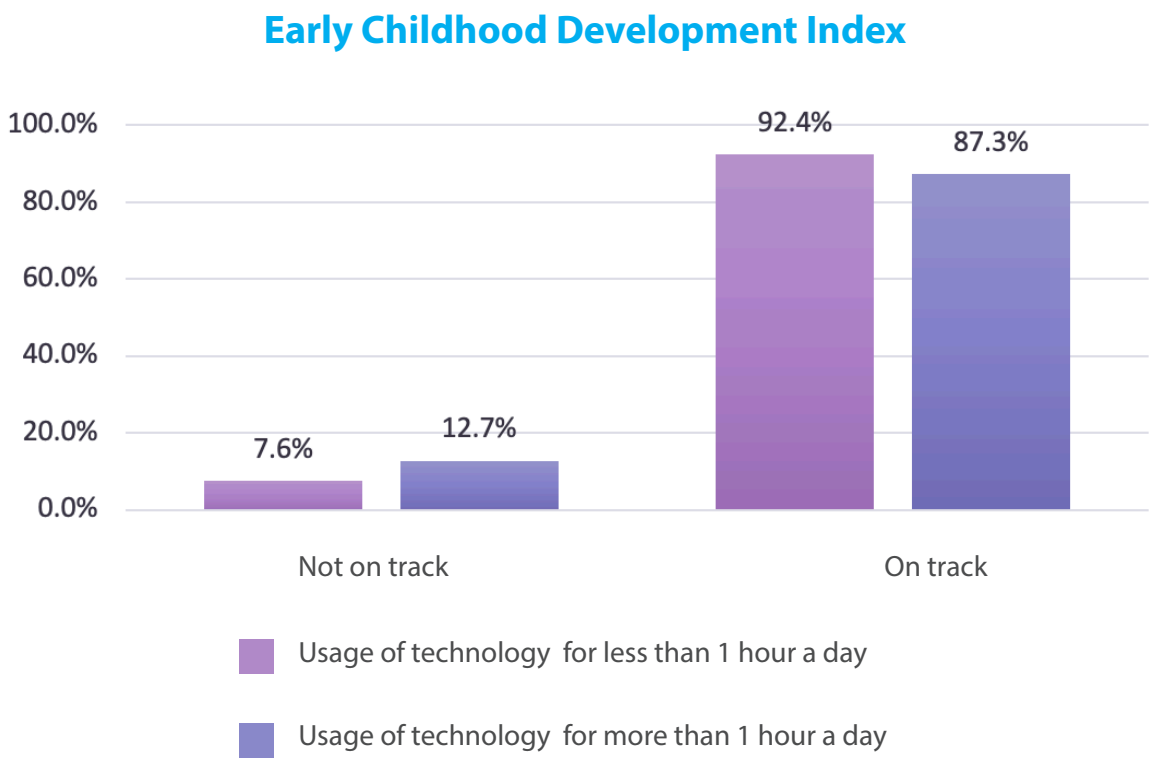
## EARLY CHILDHOOD DEVELOPMENT INDEX

In the potential outcome's section we discussed the content of ECD and its four dimensions. Given that an extensive report on ECDI is being prepared as part of Georgia MICS 2018, this section will be limited to a review of key associations between variables.

ECDI separately explains only 2 per cent of the variation of independent variable. The ECDI differs statistically significantly by the frequency with which electronic devices are used by children. Overall, 89.7 per cent of children are on track on the early childhood development. The ECD index of children using electronic devices for longer than one hour a day is 0.5 times less likely to reach a satisfactory threshold ($\chi2(1, N=1095) = 8.548, p<0.01$). A similar result is found in terms of socio-emotional development. The socio-emotional development of children using electronics for more than one hour a day is 0.4 times less likely to reach a satisfactory threshold ($\chi2(1, N=1095) = 13.382, p<0.01$).

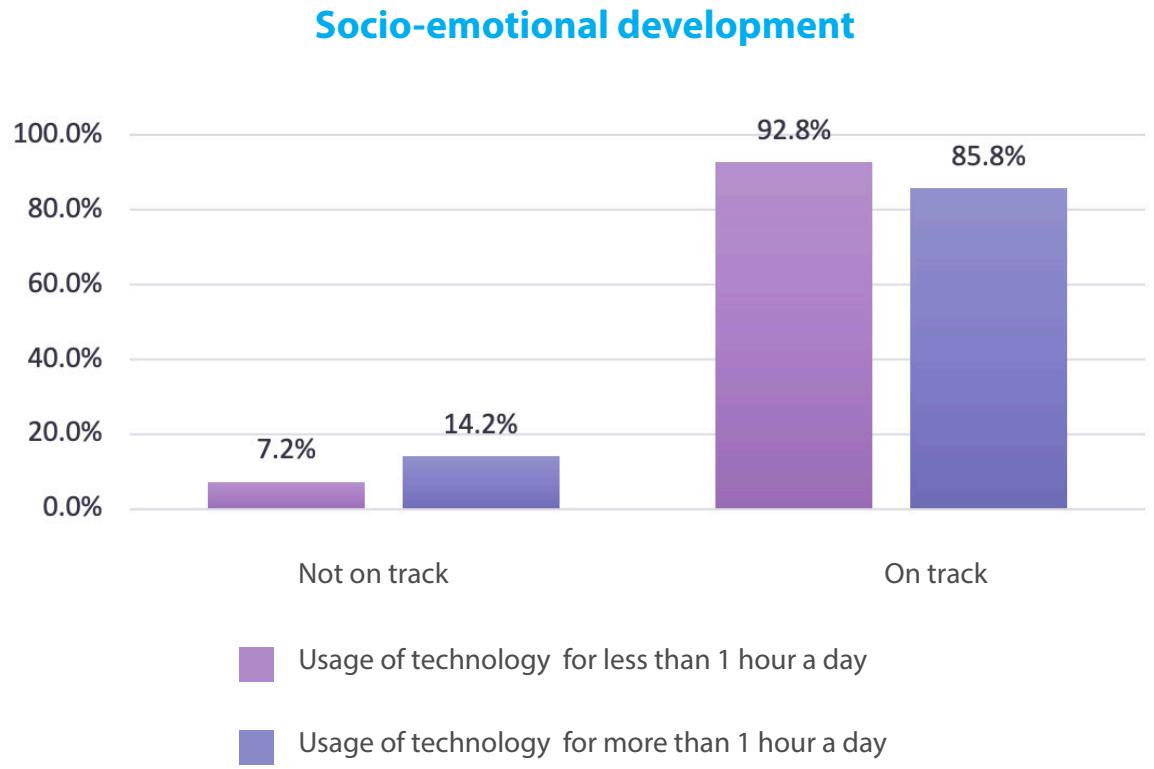
18 Anthropometrics included three dimensions: Weight for age, height for age and weight for height.
19 We have already discussed child's age effects in the section of household's characteristics.

**Figure 19. Usage of technology by children aged 2–5 years by ECDI**




*χ2 (1, N=1095) = 7.809, p<0.01*

**Figure 20. Usage of technology by children aged 2–5 years by socio-emotional development**




*χ2 (1, N=1095) = 13.660, p<0.01*

There is no statistically significant difference in the frequency of the usage of electronic devices by the literacy and numeracy development. Children who are on track and who are not, on this dimension, used electronic devices with equal frequency. Overall, 75 per cent of children who used electronic devices (regardless of screen time) are not on track in terms of literacy and numeracy.

There is no statistically significant difference in the learning ability development according to the use of electronic devices. In the other words, children on track, and children not on track on this dimension use electronic devices per day with equal frequency.

The frequency of the usage of electronic devices by children is not statistically significantly associated with the level of physical development of the child.

** It is necessary to take into account that we do not have any variation in the group according to learning ability and physical development. Ninety nine per cent of children are on track on both dimensions.*

# H. CONCLUSIONS

As part of Georgia MICS 2018, we assessed various factors related to the frequency of use of electronic devices by children aged 2–5 years. In this section we provide a brief overview of the main findings of the study and try to answer the main research questions identified above:

1. What factors lead to the frequent use of technology by children aged 2–5 years, i.e. what are the potential predictors of the usage of technology by children?

2. Is there any relationship between children's use of electronics and their early childhood development index? If yes, how does the frequent use of electronic devices affect the early childhood development and its dimensions?

## Potential predictors

- The general tendency is for children to use electronic devices for less than one hour a day. Observed result is acceptable for the target age group (two to five years old), according to the recommendations of paediatric associations. [20] The most powerful predictor that affects the usage of electronic devices by children is the child's age. The older the child, the more often he/she uses gadgets. This result is especially noteworthy for policy makers and other stakeholders because they know who is the most vulnerable target audience and therefore who should be given special attention in the future.

- Children living in urban areas use technology more often than children living in rural areas. Children from Tbilisi use electronic devices more often than children from other regions. The highest rate of the usage of technology by children for more than one hour a day after Tbilisi (41 per cent) was reported in Adjara (38 per cent), Imereti and Kvemo Kartli (35 per cent in each of them).

- The higher the family wealth index, the greater the chance that children will use electronic devices for more than one hour a day. For households in the first category, the percentage of children who use technologies for more than one hour is the smallest. In the third and fifth categories of wealth index, 32 per cent children used technologies for more than an hour a day and it's the highest rate reported.

- Household density is the stronger factor associated with the use of technologies by children, than the number of household members. In crowded households the number of children who use electronic devices for more than one hour a day reduces. However, the association between the household density and the usage of electronic devices by children can be a function of children's age. The older a child gets, the less the household density affects the frequency of the usage of electronic devices by children, as it was the case with the number of household members. Possible reason for this is that the degree of independence of the child increases with age.

- The presence of another children under the age of five in the household is associated with a low frequency of the usage of electronic devices by the children. In the households with only one child, the likelihood that a single child will use electronic devices for more than an hour a day increases compared to the households with more than one child under the age of five.

20 See details in the recommendations section.

- For those who have access to electronic devices and internet, the probability of using them for more than one hour a day almost doubles. The result is maintained even after taking into account the contextual, household and child factors.

- The children whose mothers have higher education were 1.518 times more likely to use electronic devices or watch TV for more than one hour a day, than the children whose mothers do not have a higher education. The same is true when we assess the impact of father's education.

- From the adults involvement section the only statistically significant predictor of the usage of electronics by children is mother's involvement. The more engaged the mother is, the likelihood that the child will use electronics for more than an hour a day decreases.

- The more children's books and picture books a child has, the more often he/she uses electronic devices. Association remains statistically significant even if we control for the standard variables related to the context, household and child characteristics.

- With the presence of toys from shop the frequency of use of electronic devices by children increases. These results can be explained by the fact that in households where caregivers can buy children's books and picture books and toys from shop, the frequency of use of electronic devices is more a function of access to a financial resources in the household.

- Children who experienced any psychological or physical aggression used electronic devices more often than those children who didn't experienced any aggression or violence. In both cases, the difference remains statistically significant, albeit slightly decreasing, even after controlling for other characteristics (urban living, internally displaced person status, wealth score and child's age).

## POTENTIAL OUTCOMES

In the potential outcome's section we discussed the content of Early Childhood Development and its four dimensions: Literacy and numeracy, socio-emotional development, physical development and learning skills.

- The ECD index of children aged 2–5 years using electronic devices longer than one hour a day is 0.5 times less likely to reach a satisfactory threshold.

- A similar result is found in terms of socio-emotional development. The socio-emotional development of children using electronics for more than one hour a day is 0.4 times less likely to reach a satisfactory threshold.

- As part of our research, we can talk about the tendency according to which the use of electronic devices has a negative impact on the index of early childhood development and in particular on its socio-emotional dimension. Statistically significant associations between the usage of electronic devices by children and other dimensions of their early childhood development was not revealed. However, an in-depth study of the issue is needed in the future.

# I. RECOMMENDATIONS

## RECOMMENDATIONS FOR STAKEHOLDERS: TOPIC SPECIFIC INTERVENTIONS

### 1. General recommendations

According to the American Academy of Paediatrics (AAP), children are spending close to seven hours per day on electronics. It is recommended by the AAP that screens and electronic devices for infants under two years of age should be avoided because their brains are developing quickly and they learn better at this age through interacting with people rather than screens. They also recommend that children do not spend more than one or two hours per day on electronics, and instead engage in imaginative and outdoor play, hobbies and reading (AAP, "Media and Children," 2015). [21]

As a result of our research, factors such as parental education, access to children's books and toys at home have some reverse effects on the frequency of the usage of electronics by children. In other words, according to the analysis of the results, the children whose parents have higher education use electronic devices for a longer period of time. Also, children for whom children's books and toys are available are more likely to use gadgets than those who cannot access them. Usually, the more educated a parent is and the more children's books available to the child, the less screen time the child should have. This indicates that parents who have higher education also need to be informed in this regard. When children books, toys and screens are equally accessible to a child, it is extremely important for the parent to be aware of the value of each electronic device and its impact on the child's development at a particular age. It is important for parents to be informed of what is useful, at what age, what the pros and cons of using gadgets are and how to maintain balance between positive and negative effects. In future, it is desirable that professionals facilitate frequent and detailed discussions on this topic by using different types of media, organizing webinars and public meetings, where the audience will have the opportunity to ask questions and communicate with the experts.

In accordance to AAP and the Australian guidelines, the Italian Paediatrics Society recommends, that paediatricians must remind families that parents should be good role models as children are great mimics. For this reason, parents have to limit their own media use. A more connection with children will be obtained by interacting, hugging and playing with children rather than using media. Families don't have to use media as an emotional pacifier because it will limit their children's development of their own emotional regulation. Proactive interaction between parents and children is likely the best approach. (Bozzola, et al., 2018)

21 See *https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/pages/media-and-children.aspx .*

**Table 4. Recommendations from Italian Paediatrics Association**

*Source: (Bozzola, et al., 2018)*

| NO MEDIA DEVICES USE: |
|---|
| • in children under two years of age;<br>• during meals;<br>• at least for one hour before bedtime;<br>• in case of fast-paced programmes, applications with distracting or violent content;<br>• use as a limit pacifier to keep children quiet in public places. |
| **TO LIMIT MEDIA EXPOSURE:** |
| • to less than one hour per day in children aged 2–5 years;<br>• to less than two hours per day in children aged 5–8 years;<br>• to high-quality programming;<br>• in presence of an adult. Children should share the use of media devices with caregiver in order to promote child's learning and interactions. In a world where children are growing up digital, parents play an important role in teaching them how to use technology safely. Families should monitor children's media content and applications used or downloaded.<br>• to applications by a caregiver before child's usage. More than 80,000 applications are labelled as educational, but few researches have demonstrated their actual quality. Parents should check age-appropriate applications, games and programmes to make the best choices for their children. To make sure of the quality of media used, parents can consult with paediatricians on what kids are viewing and about any issues associated with media. |

## 2. Healthy sleep habits

There are many examples of the connection between children's use of technology and sleep problems in scientific-research discourse. Consequently, although this area has not been evaluated in our study, the recommendations section provides information about healthy sleep stimulation.

Sleep problems in early life predict a greater likelihood of later development of psychopathology in childhood and adolescence (Sadeh, Tikotzky, & Kahn, 2014). In a large study (N= 32,662), short sleep duration (≤ 10h/night by maternal report) and nocturnal awakenings (≥ 3/night) in toddlers were associated with development of behavioural and emotional problems at age five (Sivertsen, et al., 2015). Sleep problems at age four have been found to predict a greater incidence of behavioural and emotional problems emerging by mid-adolescence (Gregory & O'Connor, 2002).

Here we provide recommendations by World Health Organization (WHO) on physical activity, sedentary behaviour and sleep for children under five years of age. WHO suggests, that "to grow up healthy, children need to sit less and play more".

**Table 5. Recommendations on sleep-friendly behaviours (1)**

*Source: (World Health Organization (WHO), 2019)*

| INFANTS (LESS THAN 1 YEAR) SHOULD: |
| --- |
| **Be physically active several times a day in a variety of ways, particularly through interactive floor-based play; more is better. For those not yet mobile, this includes at least 30 minutes in prone position (tummy time) spread throughout the day while awake.**<br><br>**Not be restrained for more than 1 hour at a time (e.g. prams/strollers, high chairs, or strapped on a caregiver's back). Screen time is not recommended. When sedentary, engaging in reading and storytelling with a caregiver is encouraged.**<br><br>**Have 14–17h (0–3 months of age) or 12–16h (4–11 months of age) of good quality sleep, including naps.** |
| **CHILDREN 1–2 YEARS OF AGE SHOULD:** |
| **Spend at least 180 minutes in a variety of types of physical activities at any intensity, including moderate-to-vigorous-intensity physical activity, spread throughout the day; more is better.**<br><br>**Not be restrained for more than 1 hour at a time (e.g., prams/strollers, high chairs, or strapped on a caregiver's back) or sit for extended periods of time. For 1-year-olds, sedentary screen time (such as watching TV or videos, playing computer games) is not recommended. For those aged 2 years, sedentary screen time should be no more than 1 hour; less is better. When sedentary, engaging in reading and storytelling with a caregiver is encouraged.**<br><br>**Have 11-14 hours of good quality sleep, including naps, with regular sleep and wake-up times.** |

## CHILDREN 3–4 YEARS OF AGE SHOULD:

Spend at least 180 minutes in a variety of types of physical activities at any intensity, of which at least 60 minutes is moderate-to-vigorous intensity physical activity, spread throughout the day; more is better.

Not be restrained for more than 1 hour at a time (e.g., prams/strollers) or sit for extended periods of time. Sedentary screen time should be no more than 1 hour; less is better. When sedentary, engaging in reading and storytelling with a caregiver is encouraged.

Have 10–13h of good quality sleep, which may include a nap, with regular sleep and wake-up times.

## SLEEP-FRIENDLY SCREEN BEHAVIOUR RECOMMENDATIONS FOR CLINICIANS AND EDUCATORS:

- Talk with families about the importance of adequate sleep.
- Recommend building healthy sleep habits starting as young as possible.
- Teach families about the negative effects of evening use of light-emitting screens on sleep.
- Encourage regular bedtimes that allow adequate time for sleep, and regular bedtime routines in the hour before bed, consisting of calming activities and avoidance of screen media.
- Advise families to restrict all screen devices from bedrooms, including TVs, video games, computers, tablets, and cell phones. Encourage parents to be good role models by following these rules themselves.
- Consider insufficient sleep as a contributing factor for youth exhibiting mood, academic, or behavioural problems.
- Inspire children of all ages to develop autonomy and self-regulatory skills to maintain healthy screen media habits.

**Table 7. Recommendations on sleep-friendly behaviours for parents (3)**

*Source: (Hale, et al., 2018)*

| SLEEP-FRIENDLY SCREEN BEHAVIOUR RECOMMENDATIONS FOR PARENTS: |
|---|
| **ESTABLISH SCREEN HABITS FOR YOUR CHILDREN WHICH ENABLE HEALTHY SLEEP** |
| • Plan a bedtime that allows for adequate sleep.<br>• Avoid screens in the hour before bedtime and at night time.<br>• Replace evening screen time with calm activities for your children (reading, colouring, conversation, etc.).<br>• Keep all screen devices (TVs, video games, computers, tablets, and smartphones) out of bedrooms.<br>• Avoid passive background media: Children may be affected by screen media even when they are not actively engaged.<br>• Content matters: Avoid violent and/or scary media, which can negatively affect your children's sleep.<br>• Family rules/routines are most effective when applied to all children in the household. |
| **ESTABLISH OTHER HEALTHY SLEEP PRACTICES FOR YOUR CHILD AND YOURSELF** |
| • Set and abide by regular bedtimes every day, including weekends, allowing the child sufficient sleep duration for his/her age.<br>• Bedtime should follow a predictable routine (e.g.: brush teeth, read a story, lights out).<br>• Bedrooms should be cool (65–70 degrees), comfortable, dark and quiet.<br>• Avoid evening intake of chocolate or beverages that interfere with sleep (soda, tea, coffee, energy drinks).<br>• Include physical exercise into the daily routine, and spend time outdoors during sunlight hours when possible. |
| **BE A HEALTHY SLEEP ROLE MODEL BY PRIORITIZING YOUR OWN SLEEP** |
| • Improve your own sleep-related behaviours (e.g., reduce screen time before bedtime, establish a regular bedtime, etc.) to improve your health and well-being.<br>• Turn off electronic media devices in the evening throughout the household and charge all mobile devices in a central location outside bedrooms.<br>• Parents who are overtired are less able to parent effectively, including being proactive in orchestrating child routines and dealing effectively and calmly with daily hassles that are part of everyday life. |

**SLEEP-FRIENDLY SCREEN BEHAVIOUR RECOMMENDATIONS FOR PARENTS:**

**PARENT YOUR CHILD WITH CLEAR COMMUNICATION, AWARENESS, FAIR, AND CONSISTENTLY DEVELOPMENTALLY APPROPRIATE RULES**

- **Talk with your child or teen early and often about the importance of adequate sleep for optimal health.**
- **Be aware of how much time your child or teen spends engaging in screen media, including before and after bedtime.**
- **Pay attention to your child or teen's mood and behaviour at home, and discuss concerns you may have. Mood impairment is often caused by inadequate sleep.**
- **Establish and enforce appropriate media and sleep rules for your children as early in their lives as possible; consistently point out after-effects of failing to follow those rules (e.g., being tired and cranky the next day after playing games too late) to develop your child's understanding of the effects of inadequate sleep.**
- **Work with teens to jointly develop healthy sleep routines that also allow them to meet obligations (e.g., homework or sports) and are consistent with the guidelines above. Developing autonomy and ability to self-regulate is important for teens, as is consistency.**

## 3. Parental involvement

Among many other virtues, good parenting involves supporting the child to develop empathy, honesty, self-reliance, self-control, kindness and cooperation. It also promotes intellectual curiosity, motivation and the desire to achieve (Patrikakou, 2016). Although technology occupies one of the leading places in our daily lives and we spend a lot of time with them, the basic principles in the relationship between a child and a parent have not changed. Technology cannot replace the role of the parent in the development of the child. Moreover, parents are one of the leading agents in the process of establishing a healthy relationship between children and technology. In her book The 10 Basic Principles of Good Parenting Steinberg (2005, 2011) refers to parents: "what you do matters; you cannot be too loving; be involved in your child's life; adapt your parenting to fit your child; establish rules and set limits; help foster your child's independence; be consistent; avoid harsh discipline; explain your rules and decisions; treat your child with respect."

The figure below illustrates the interrelated principles of parent involvement and offer specific suggestions about how they can be applied in this era of technology and media immersion *(see Figure 21).*

**Figure 21. Ten interrelated principles of parent involvement applied to technology and media use**

*Source: (Patrikakou, 2016)*

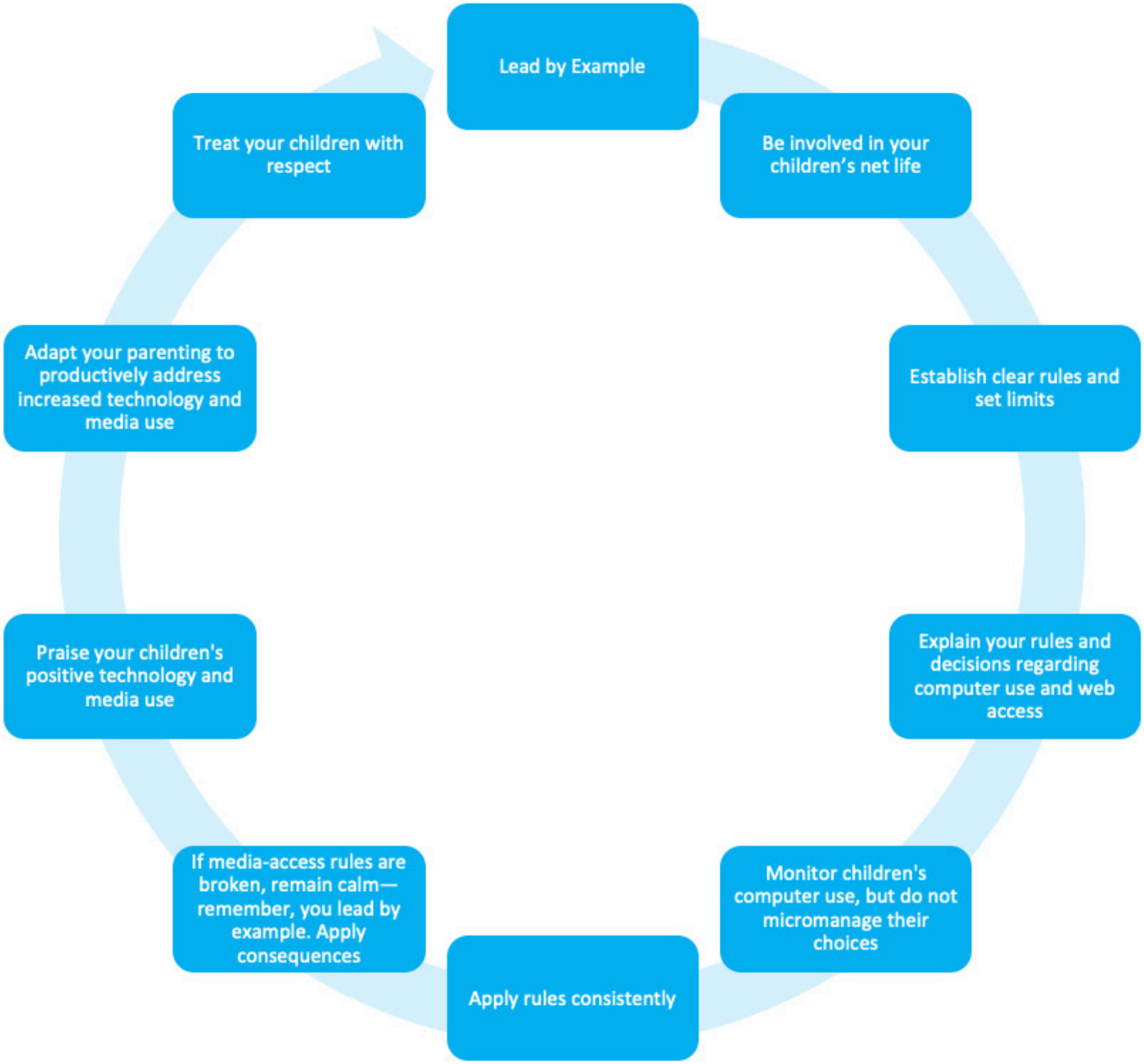


**Table 8. Recommendations on parental involvement**

*Source: (Patrikakou, 2016)*

| TO ELABORATE UPON THE PRINCIPLES DEPICTED IN FIGURE 21: |
|---|
| **Lead by example. Stop being in front of a screen all the time. Email, text, and browse online as you would like your children to use those communication tools.** |
| **Be involved in your children's net life. Know how they spend their time online. Ask them to show you their favourite sites, music videos, etc. Play their favourite video games together—it's always fun to beat your parents!** |
| **Establish clear rules and set limits for web access, downloading and generic screen time. Tech use and web access for entertainment is a privilege—sticking to the rules makes it earned or lost.** |
| **Explain your rules and decisions regarding computer use and web access, even those that seem self-evident to you (e.g., no crossing the street while texting). Highlight the reasons for blocking content that is not developmentally appropriate; review and discuss web dangers with your children— and brace yourself for occasional eye-rolling!** |
| **Help foster your children's independence by closely monitoring their computer use, but not micromanaging their choices (e.g., music, games) if they are within your established rules. You want your children to ultimately make safe choices for themselves.** |
| **Apply rules consistently. Clarify what is non-negotiable and stick to it—do not give in to temporarily save yourself from your kids' whining, as major grief awaits you down the road.** |
| **If media-access rules are broken, remain calm—remember, you lead by example. Apply consequences, also making it a teachable moment. Do not make it a power struggle or a shouting match, but part of teaching your children accountability and keeping them safe, so that they can take ownership and control of their lives.** |
| **Praise your children's positive technology and media use, online kindness, and thoughtfulness towards others. Do not be fazed by the all-too-familiar teenagers' eyeroll; they too crave praise and acknowledgement, as long as it is out of their friends' earshot!** |
| **Adapt your parenting to productively address increased technology and media use instead of resisting it—it's here to stay. Be part of your children's online life; be open to exploring it together and learning from their tech-savvy ways.** |
| Treat your children with respect as you would like them to treat you and others, both in person and online. Be attentive to what they say via any online communication venue, and acknowledge their point of view. Beware: technology does not eliminate face-to-face conversations that foster growth. Allow children to talk about what is important to them! |

# Recommendations for future research

In future, to describe a realistic picture of children's use of electronic devices and time spent in front of the TV, it is important to identify potentially related constructs with maximum accuracy and thus, create a reliable and valid measurement instrument. This section of the report provides recommendations that will guarantee the collection of reliable and valid data. We divided the recommendations into three areas, namely: (1) Recommendations on research sample; (2) recommendations on areas/dimensions to be evaluated; and (3) recommendations on research instrument.

## 1. Recommendations on research sample

**It is extremely important to include the full age category of children.** To predict the frequency and results of the use of electronic devices by children in Georgia, it is extremely important, first of all, to specify how we define the term "child". Within the scope of this study, the frequency of use of electronic devices is traced only in the population aged two to five years. No matter how critical the impact of frequent use of technology at this age is, it has no less severe impact on the development of children over the age of five years. Therefore, it is important to increase the study population to study the issue in depth. According to the Code of the Rights of the Child, [22] a child is a person under the age of 18. As such, it would be interesting to study this population in the future.

Numerous studies reveal the impact of electronic devices on different areas of child development at different ages. However, we cannot say unequivocally that these influences are uniquely negative in nature. An important challenge, as research on children's use of digital technology moves forward, is to understand where to draw the line between healthy and harmful use, which is likely to require an individual approach where each child and their life context is considered separately. Although few negative impacts have been found in relation to the time children spend using digital technology, to maximize the positive impact in younger children provisions and support may be required of a different nature than for older children. Similarly, what is harmful for a very young child to see or do online may be largely unproblematic or even positive for an older child. (Kardefelt-Winther, 2017) Studies, mentioned above, show that when it comes to impact, it is extremely important to pay attention to the content a child consumes through gadgets. Manipulating the frequency of use alone reduces the ability to access in-depth relationships and to evaluate the real picture. This is directly proportional to the degree of effectiveness and instrumentality of the research-based recommendations.

It would be extremely interesting to have a longitudinal research that would allow us to observe the frequency and content of technology consumption by children in dynamics and analyse it in terms of their development.

In addition, in terms of generalizing the results, it is extremely important that the sample be representative of the population—reflecting the characteristics of the target population with maximum accuracy. The research will allow for complex analysis if randomized stratified sampling methodology will be used, where data will be collected at several levels, namely: regional, rural, urban, kindergarten and school. In this case, the novelty is the addition of school factors, given that the age categories have increased.

22 Law of Georgia, Code of the Rights of the Child, Article 3 –
See: https://matsne.gov.ge/ka/document/view/4613854?publication=1
We also come across a different definition of the term "child", namely: the Convention on the Rights of the Child (1989) states that "For the purposes of the present Convention, a child means every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier." - Article 1 -
See: https://matsne.gov.ge/ka/document/view/1399901?publication=0 ; https://www.ohchr.org/en/professionalinterest/pages/crc.aspx

Another factor to consider is that the sample should reflect the cultural diversity of the population, therefore, appropriate interventions should be planned to ensure the inclusion of ethnic minorities in the study. Involvement of children with different types of disabilities in research should also be ensured.

## 2. Recommendations on the areas/dimensions to be evaluated

**It is important to increase the number of areas to be evaluated.** Given the previous recommendation, the expansion of the age category of the target population also increases the number of areas to be assessed in relation to electronic devices and time spent with the TV. It is extremely important to identify these areas on the basis of in-depth analysis of the related scientific-research literature. In particular, the results of various studies should be critically evaluated in terms of what contributes to children's long-term exposure to electronic devices and television, and what are the key areas of child functioning that are affected by this factor. Clearly, depending on which area is leading at this or that stage of a child's development, it is important to distinguish the appropriate configuration of the dimensions to be assessed for children of different ages. For example, studies show that the use of gadgets is associated with difficulty concentrating and sleeping at different ages (Ehmke, n.d.) (Hale, et al., 2018) (Fuller, Lehman, Hicks, & Novick, 2017) (Bozzola, et al., 2018). It is important to evaluate these areas in the future in order to determine the relationship between these factors based on the example of Georgian children.

**It is important to evaluate the impact of time spent on the computer, smartphone or tablet and TV independently of each other.** Mobile media differs from television in its multiple modalities (eg., videos, games, educational apps), interactive capabilities, and near ubiquity in children's lives (Radesky, Schumacher, & Zuckerman, Mobile and Interactive Media Use by Young Children: The Good, the Bad, and the Unknown, 2015). Given that the use of mobile technologies and watching TV have different effects on children's development and these effects also vary according to the child's age, it is important to evaluate them separately. Therefore, in case of in-depth analysis of this issue, taking this into account will be an important prerequisite for the validity of the research results.

## 3. Recommendations on the research instrument

**A reliable and valid research instrument should be developed.**[23] Once the target population and the areas to be assessed within the study are identified, an important issue that ultimately affects the quality of the research is the selection and development of appropriate tools. Given that in the future it is desirable to evaluate persons under 18 years, it may be necessary to compile different methods of evaluation. We may also obtain more accurate information based on surveys from several relevant sources, such as parent and child (appropriate age).

**Finally, the research tool should adequately reflect the diversity of the areas to be assessed.** One of the most critical steps for the development of a reliable and valid instrument is to determine its content validity, which we conclude on the basis of expert evaluation. In psychometrics, content validity refers to the extent to which a measure represents all facets of a given construct, it concerns, primarily, the adequacy with which the test items adequately and representatively sample the content area to be measured (for detailed information, see: (Thorn & Deitz, 1989)).

23 We mean creating an original tool as well as adapting/standardizing an existing one (if possible).

# J. REFERENCE SECTION

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